iCON-101CS

1-port CAN to RS-232/422/485 Industrial Converter

User's Manual

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November 2011, Version A1

Printed in Taiwan

ESD Precautions

Computer boards have integrated circuits sensitive to static electricity. To prevent chipsets from electrostatic discharge damage, please take care of the following jobs with precautions:

- Do not remove boards or integrated circuits from their anti-static packaging until you are ready to install them.
- Before holding the board or integrated circuit, touch an unpainted portion of the system unit chassis for a few seconds. It discharges static electricity from your body.
- Wear a wrist-grounding strap, available from most electronic component stores, when handling boards and components.

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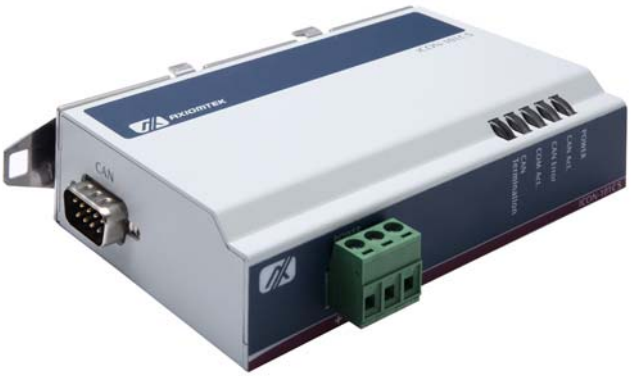
Chapter 1
Introduction



The CAN (Controller Area Network) is a serial bus system and is usually used in structuring intelligent industrial device networks and building smart automatic control systems. The iCON-101CS is an industrial converter ideally suitable for CAN network using traditional RS-232/422/485 devices. It precisely converts messages between CAN and RS-232/422/485 networks, allowing any PC or devices with RS-232/422/485 interface to communicate with CAN devices easily. This converter supports CAN monitor tool and displays the CAN message received in Decimal or HEX mode. The iCON-101CS shows the time stamp of each receiving message. The GUI management program and programming guide both are ready for use.

1.1 Features

- Software configurable CAN and RS-232/ 422/ 485 communication parameters
- Fully compliance with CAN 2.0A and CAN 2.0B
- D-sub DB9 CAN port support 3KV isolation
- Easily setup to CAN and RS-485 terminator by software configurable
- Powered by 10~30V wide-range DC
- Transmission speed up to 1Mbps for CAN and RS-232
- Clear LED indicators to converter status in progressing
- Provides DIN-Rail mounting
- -40~70℃ wide temperature operating Suitable for industrial automation and power automation field applications

1.2 Specifications

CAN Interface

- **Connector**
  - 9-pin male D-Sub
- **Isolation**
  - 3 KVrms for DC-DC and photocoupler on CAN side
- **Receive Buffer**
  - 1000 data frames
- **NVRAM**
  - 64Kbyte (for user-defined)
- **Max Data Flow**
  - 10000 fps (CAN bus)
- **Support Protocol**
  - CAN 2.0A/2.0B
- **Terminator Resistor**
  - Software configurable
- **Baud Rate**
  - 5k,10k, 20k, 40k, 50k, 80k, 100k,125k, 200k, 250k, 400k, 500k, 600k, 800k ,1Mbps and user-defined

Serial Interface

- **Support Protocol**
  - RS-232/422/485
- **Connector**
  - 9-pin male D-Sub

Power

- **Power input**
  - 10 to 30 VDC(Terminal Block)
- **Power Consumption**
  - 0.9W Max. 0.08A@10VDC, 0.03A@30VDC

Mechanical/Environment

- **Casing**
  - Aluminum case

- **LED**
  - Power, CAN TX/RX, CAN normal and error status, Serial TX/RX, terminator status

- **Dimensions**
  - 70 mm (W) x 110 mm (D) x 30 mm (H) (2.75" (W) x 4.33" (D) x 1.18" (H))

- **Weight**
  - 0.25 kg (0.55 lb).

- **Operation Temperature**
  - -40°C to +70°C (-40°F to +158°F)

- **Storage Temperature**
  - -40°C to +85°C (-40°F to 185°F)

- **Humidity**
  - 5% - 95% (non-condensing)

- **Emission Compliance**
  - CE class A, FCC class A

Note: ***All specifications and images are subject to change without notice.***

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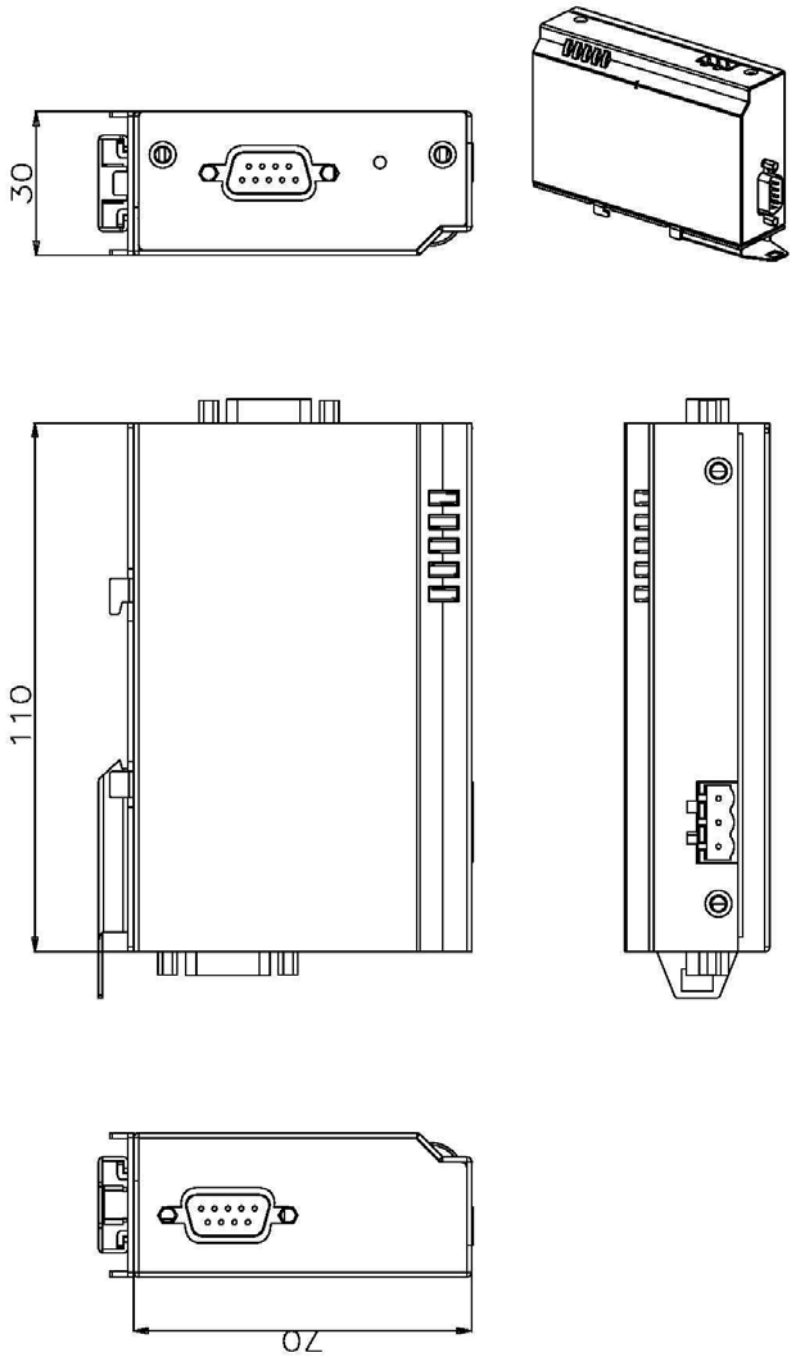
Chapter 2
Hardware Description

2.1 Hardware Dimensions



2.2 Status LED Indicator

The iCON-101CS is equipped with 5 LEDs. You can monitor status of device operation by observing these LEDs.

Number	Color	Description
D1	Green	Light on for Power on.
D2	Green	Light on for CAN TX, Flashing for CAN RX, Light off for idle.
D3	Orange	Light on for CAN transmission error. Light off for transmission normal.
D4	Green	Flashing for Serial port transmission.
D5	Orange	Light on for CAN termination resistor turn on. Light off for CAN termination resistor turn off.
D5	Green	Light on for RS485 termination resistor turn on. Light off for RS485 termination resistor turn off.

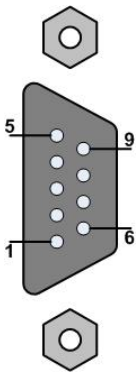
2.3 Connectors

Signals go to other parts of the iCON-101CS through connectors. Loose or improper connection might cause problems, please make sure all connectors are properly and firmly connected.

2.3.1 CAN Interface Connector

The CAN interface is a standard DB-9 connector for interfacing to CAN network.

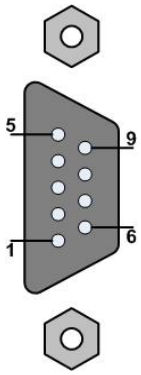
Pin	Signal	Function
1	NC	No connect
2	CAN_L	CAN data line (Low)
3	ISOGND	Ground
4	NC	No connect
5	NC	No connect
6	ISOGND	Ground
7	CAN_H	CAN data line (High)
8	NC	No connect
9	5V (Optional)	5V (Optional)



2.3.2 RS-232/422/485 Connector

The RS-232/422/485 connector is a standard DB-9 connector. It supports RS-232/422/485 protocol.

Pin	RS232	RS422	RS485
1	--	TX+	--
2	RXD	RX-	D-
3	TXD	RX+	D+
4	--	--	--
5	GND	GND	GND
6	--	--	--
7	RTS	TX-	--
8	CTS	--	--
9	--	--	--

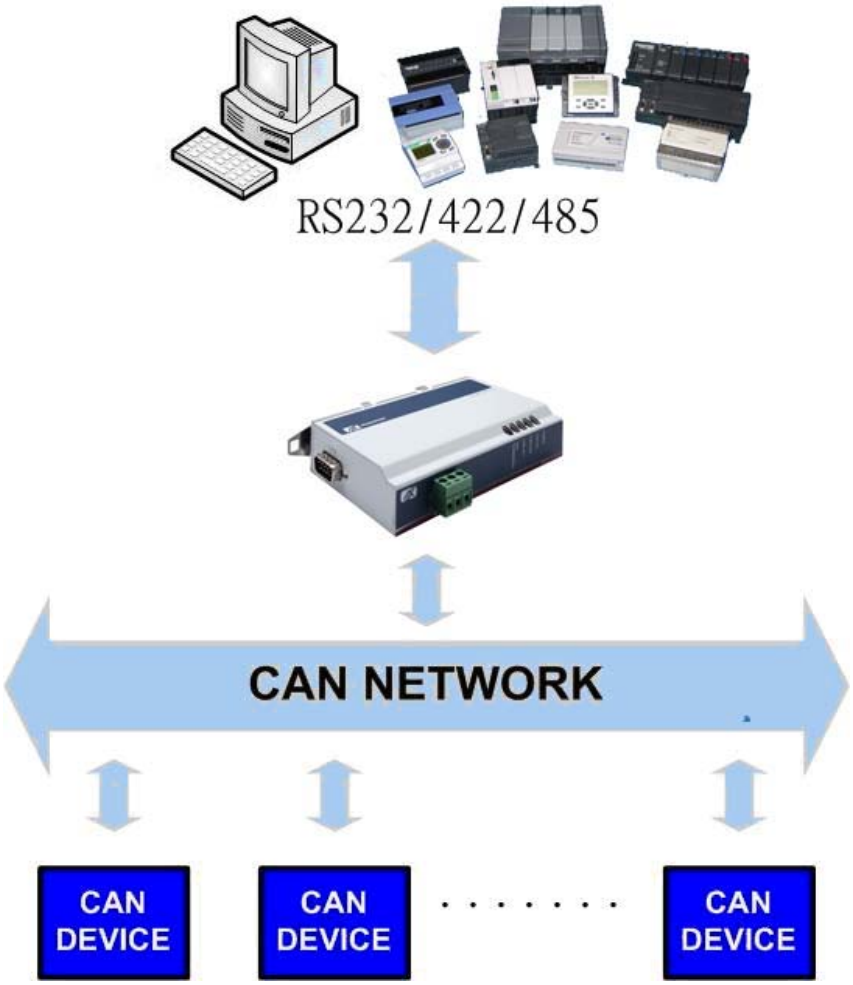


2.3.3 Power Connector

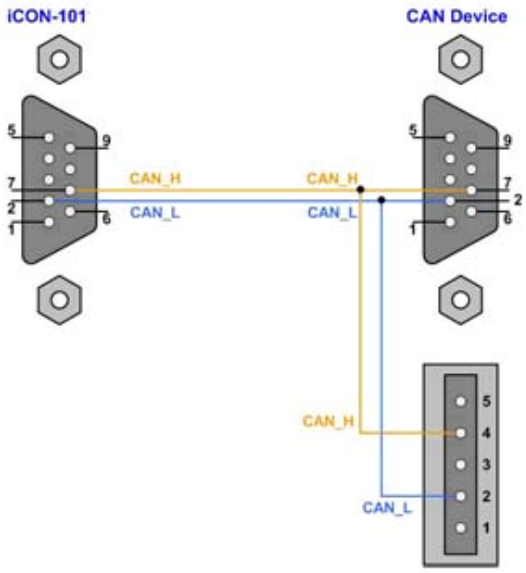
Pin	Power
+	Vcc
-	GND
⏚	Shielding

2.4 Hardware Connection

The iCON-101CS provides convenient interface for communicating with CAN devices from device's RS-232/422/485 port. Below images illustrate CAN application and hardware wiring of the iCON-101CS.



CAN Application Diagram



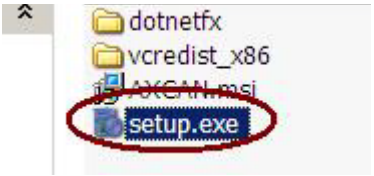
Hardware Wiring Diagram

Chapter 3
Software Installation

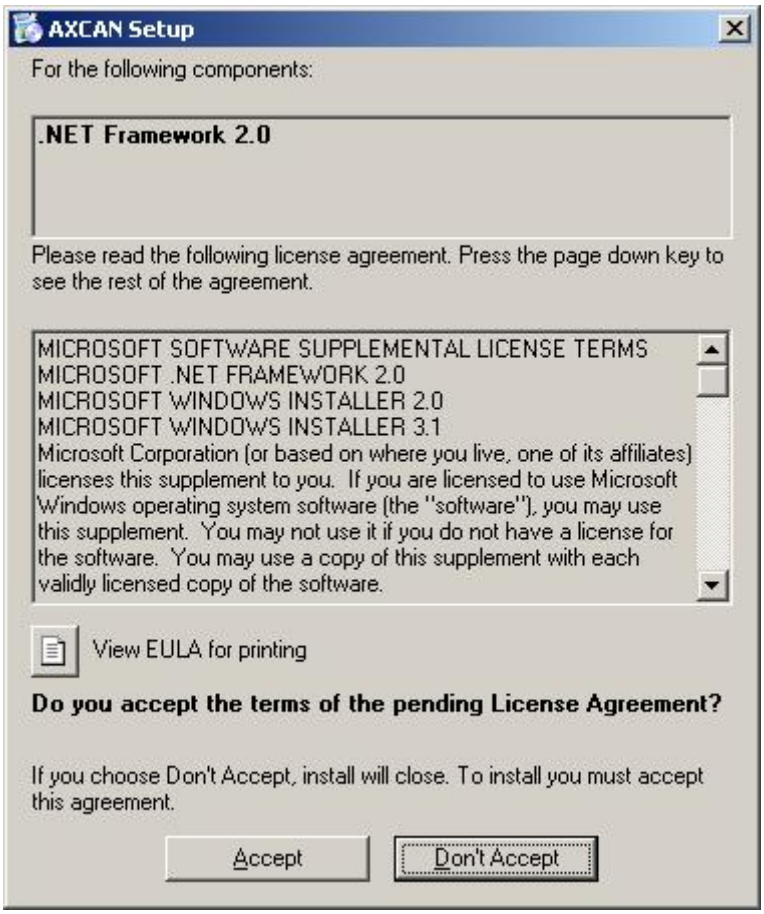
3.1 Utility Installation

This section describes how to install AXCAN software utility. Please follow the step by step instructions given below.

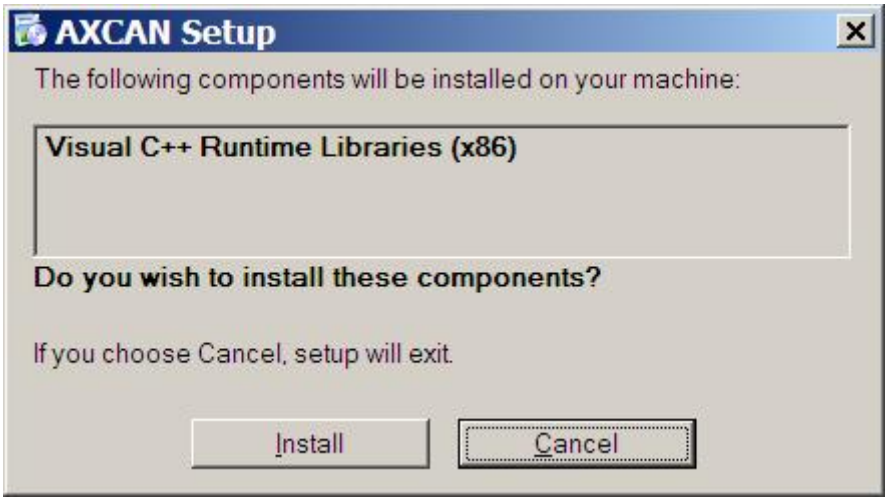
1. Double click the setup icon to run setup.exe program and begin installation.



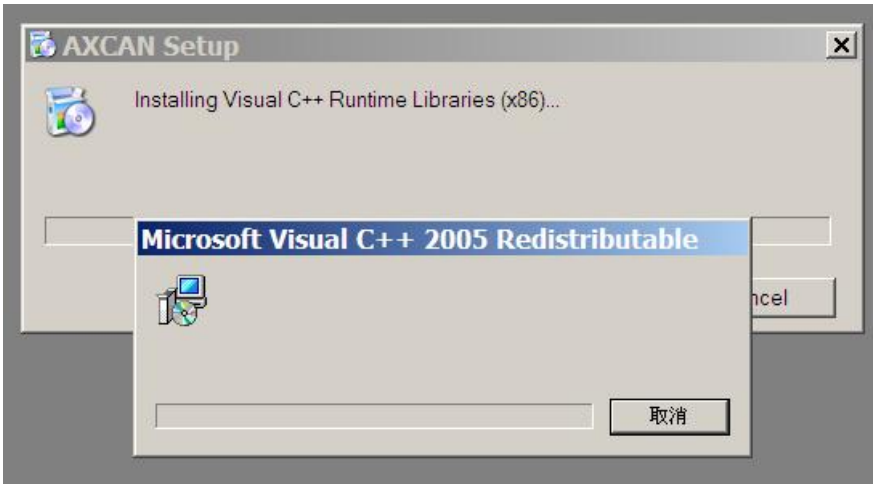
2. The setup program automatically detect whether .NET Framework 2.0 exists in your computer. Read the license agreement and make your choice.



3. Click Install button to install Visual C++ Runtime Libraries (x86).

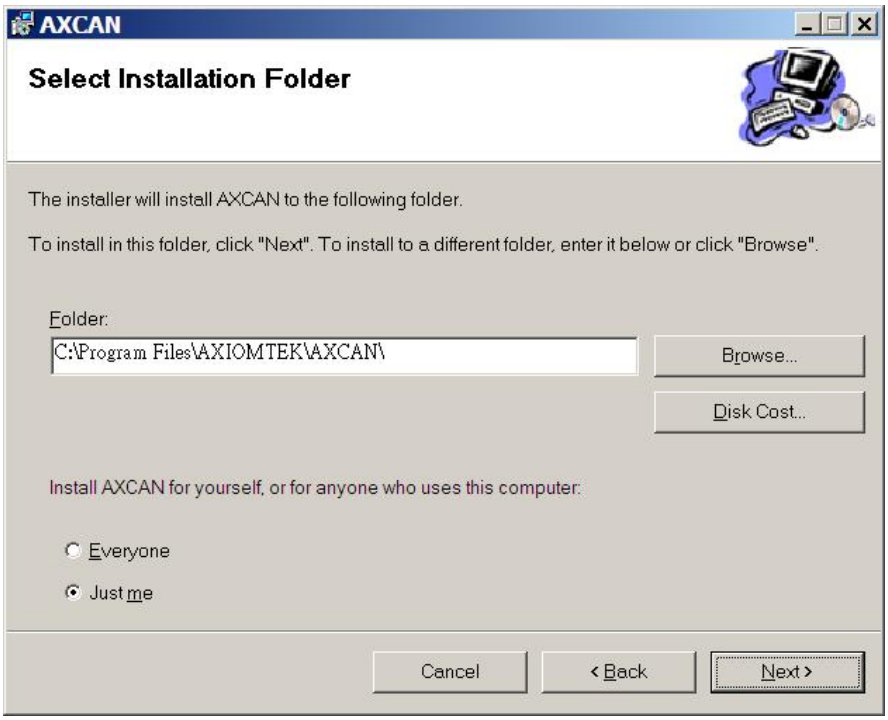


4. The setup program is installing files of Visual C++ Runtime Libraries (x86) into your computer.

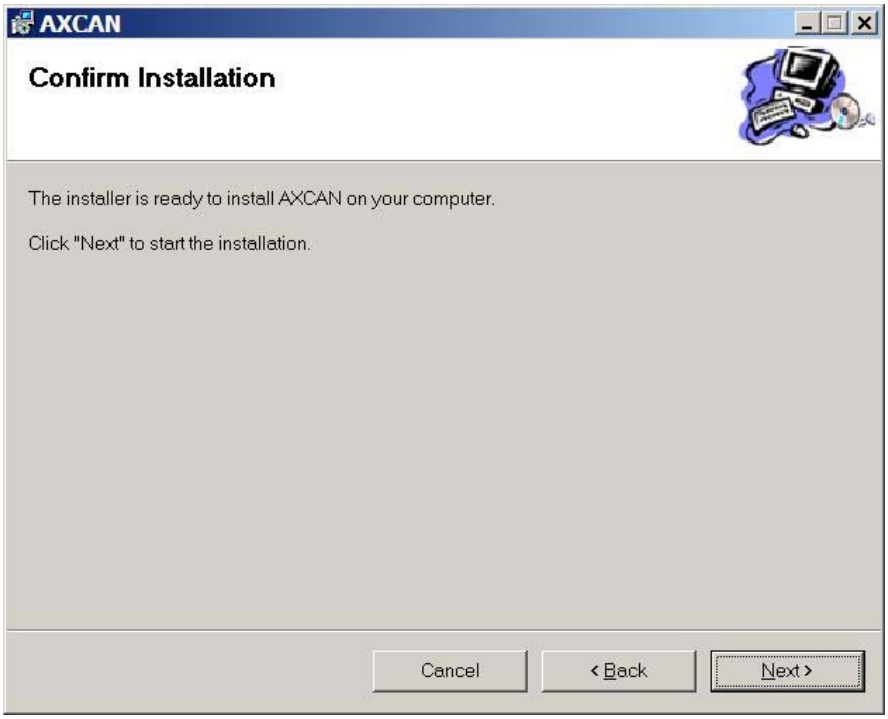


5. After all of the necessary components are installed, let's continue with AXCAN utility setup wizard.

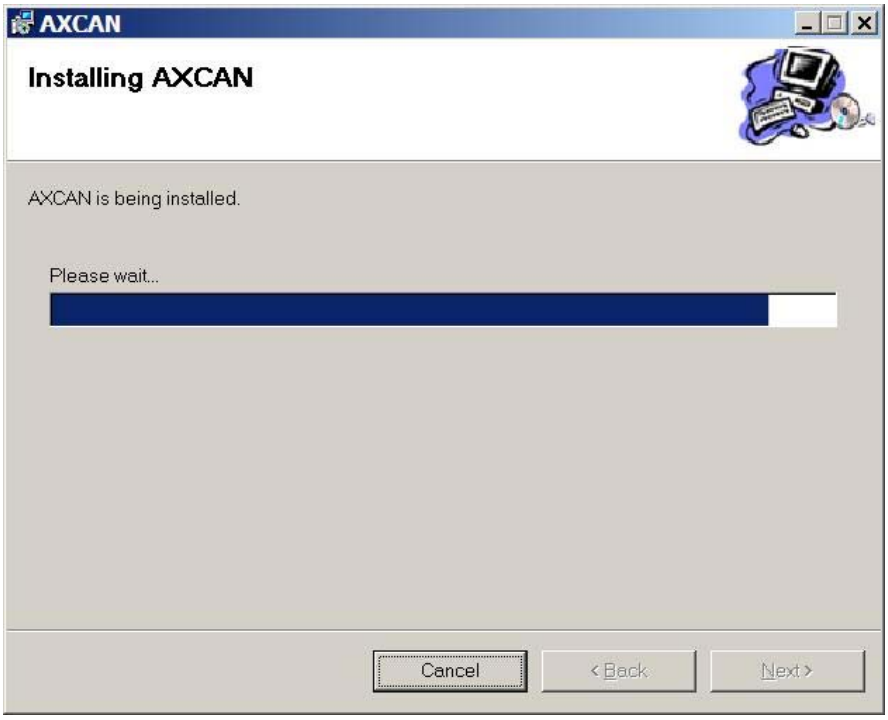
6. By default, the utility is installed to C:\Program Files\AXIOMTEK\AXCAN. Change the location if needed. Select the permission to install AXCAN for yourself or for anyone who uses this computer. Click Next to continue



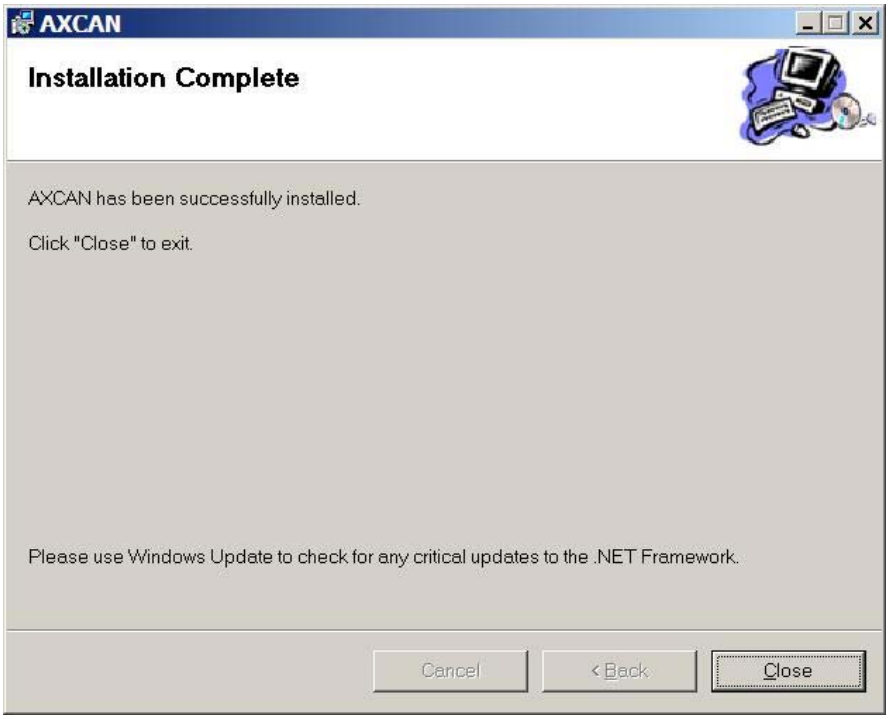
7. Now the setup program is ready to install AXCAN software utility. Click Next to continue.



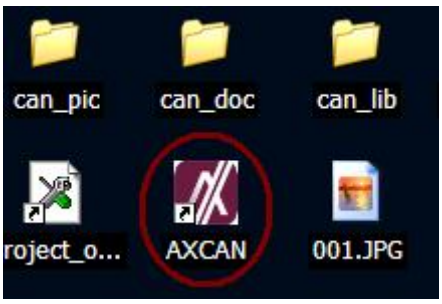
8. The setup program is installing AXCAN software utility. Wait until the installation is complete before progressing to the next step.



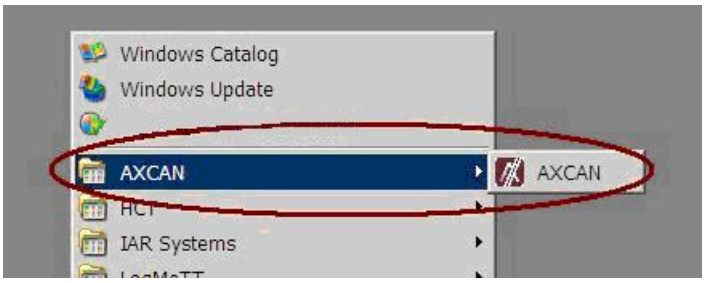
9. The AXCAN software utility has been successfully installed. Click Close to exit.



10. After installation, a shortcut icon is automatically created on your desktop.



11. The setup program also creates program menu shortcut of AXCAN.



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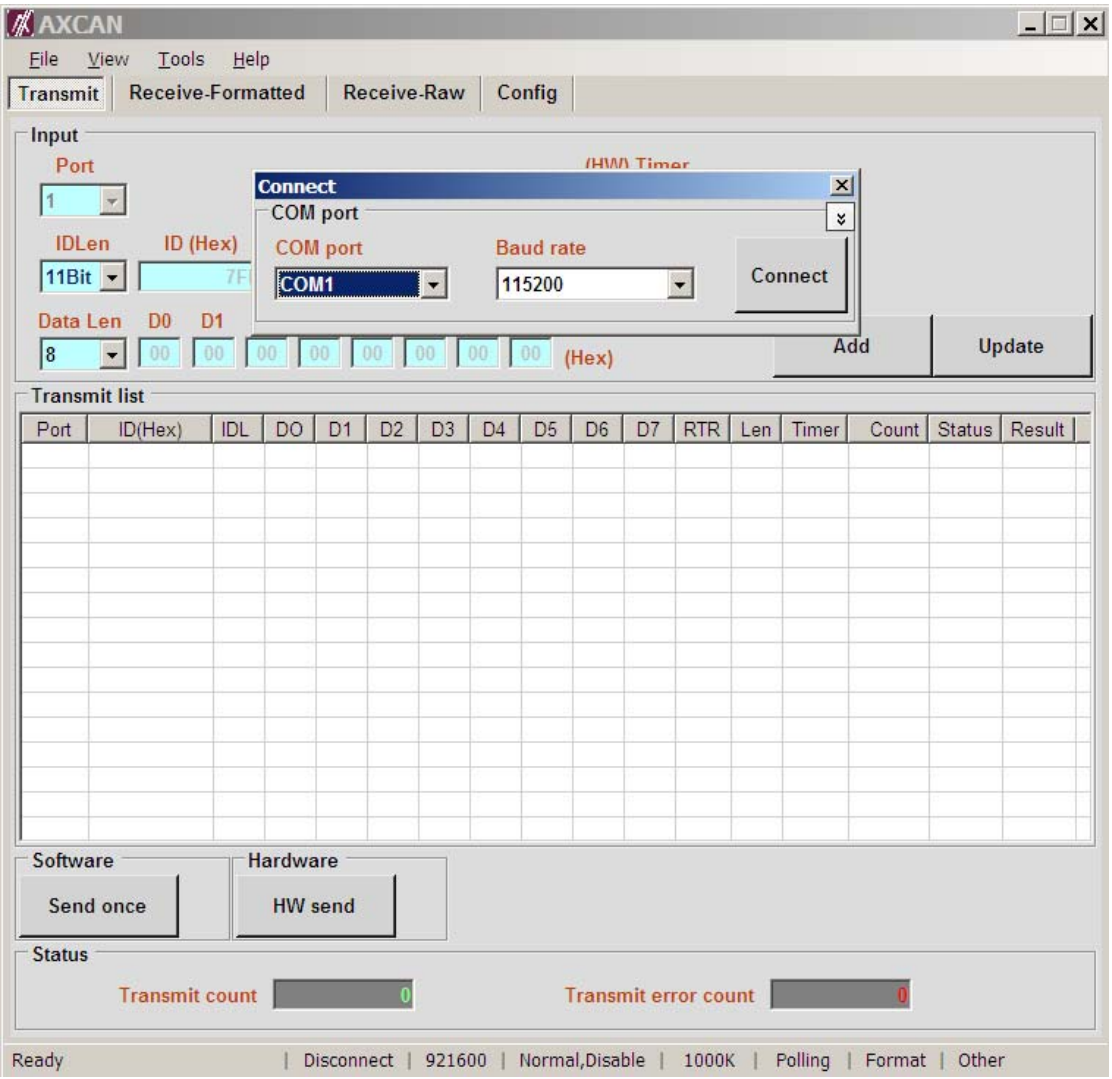
Chapter 4
Using Software Utility

4.1 Overview

Before you start using AXCAN software utility, please check the hardware connection:

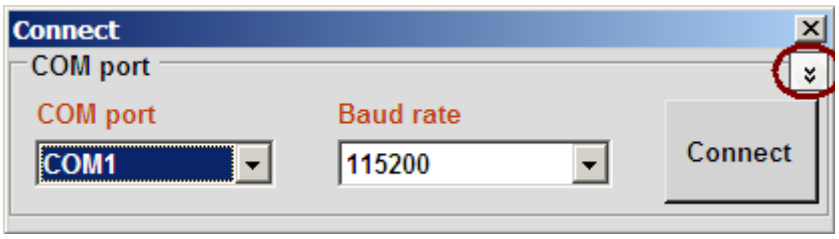
- Firmly connect the iCON-101CS's RS-232/422/485 connector to device's serial port.
- Firmly connect the iCON-101CS's CAN interface connector to CAN devices.

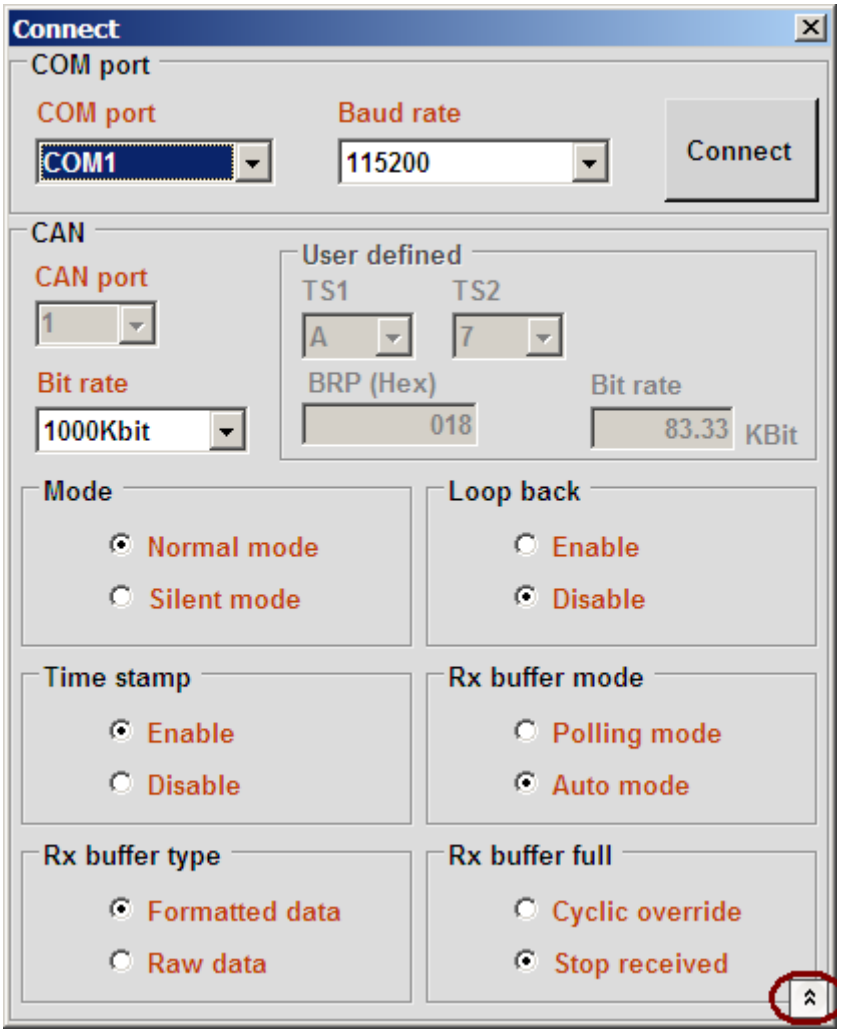
Use this utility to configure CAN communication parameters. It is also used to transmit or receive CAN messages for simple function testing. Open utility program by clicking AXCAN.exe.



4.2 Connect Setting Window

Find the double arrows to the bottom button on Connect Setting window. Click this button to open more detailed hidden settings window. To close, click on the double arrows to the top button. Use the parameters on this window for connection settings.





Enter connection parameters properly, see below information, then click the Connect button. The software automatically saves all settings when the CAN connection is established successfully.

COM port
Use this item to select COM port no. which is an interface between device and a PC.

Baud rate
Select COM port baud rate.

CAN port
Select CAN port no. which is an interface between device and device.

Bit rate
Select CAN communication bit rate. Bit rate is the number of data bits transmitted per second in CAN communication channel.

User-defined : TS1, TS2, BRP
User can define bit rate based on this parameters. Bit rate = (36M / ((TS1+TS2+1) * BRP)).

CAN Mode
Normal mode is for CAN normal operation. In silent mode, the device is set as receive-only.

Loop back
Enable/disable loopback. If loopback is enabled, the device is set as transmit-only. It receives only messages routed internally from TX to RX.

Time stamp
Enable/disable timestamp. Time stamp is the time at which message is received by PC (per bit rate).

Rx buffer mode

Polling mode	Device sends message back upon PC request.
Auto mode	Device sends messages back to PC automatically. In auto mode, you cannot transmit data.

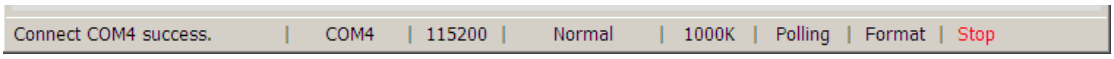
Rx buffer type

Formatted Data	Device sends back formatted data.
Raw Data	Device sends back raw data.

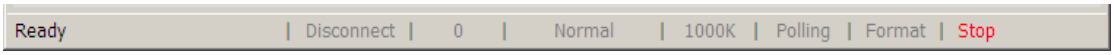
Rx buffer full

Cyclic override	Overwrite old data when device buffer is full.
Stop received	Stop receiving data when device buffer is full.

The status bar shows “Connect COMx success” message, when success connection is established. You can also see the connection parameters on the status bar.

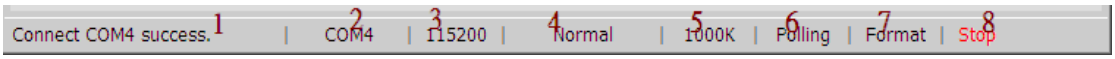


If connection attempt failed, the status bar shows “Disconnect” message. And at the same time, the connection parameters show up in gray.



Status Bar Information

The status bar displays at the bottom of Connect Setting window. It provides feedback of current settings and status information.

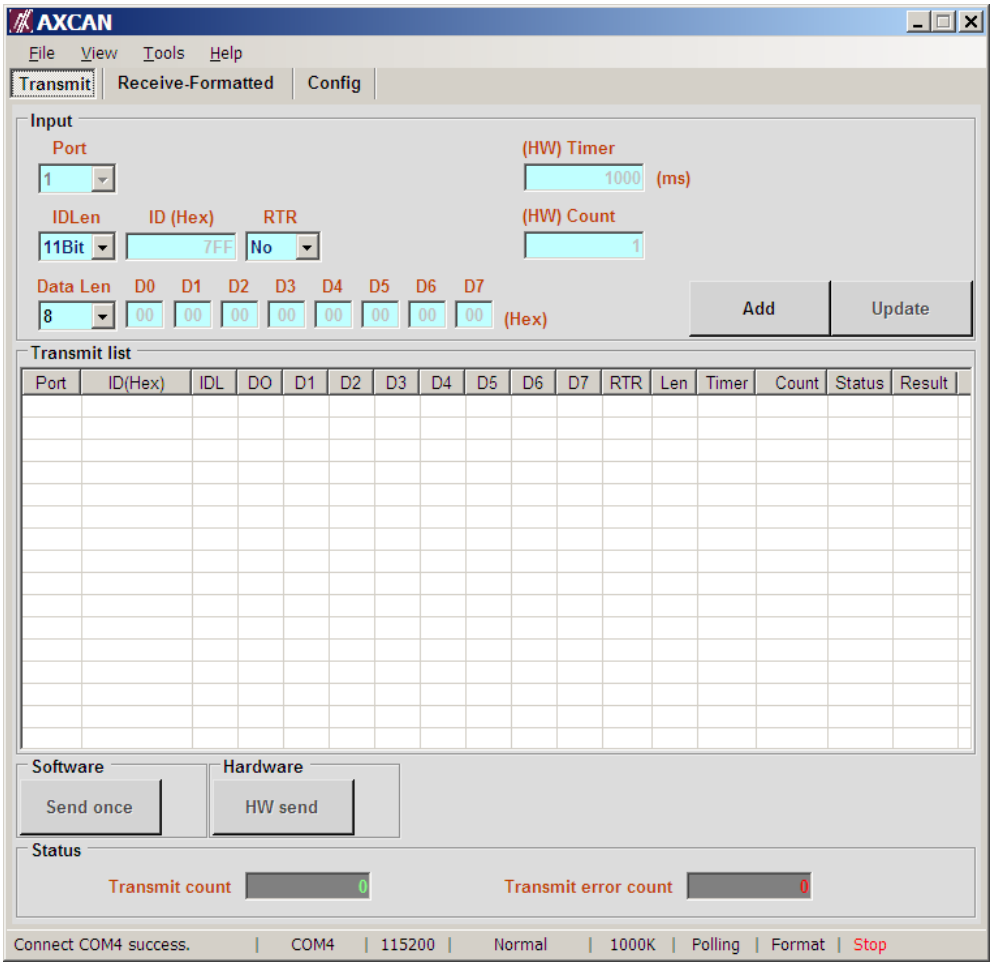


1. Connection messages.
2. COM port no. or Disconnect message.
3. COM port baud rate.
4. CAN operation mode.
5. CAN communication bit rate.
6. Rx buffer mode.
7. Rx buffer type.
8. Other status information; Stop, Polling, Looping or Testing.

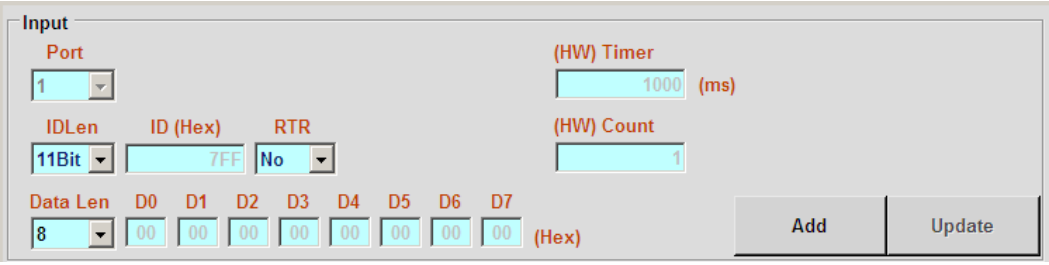
4.3 Transmit Setting Window

After success connection is established, the Transmit Setting page appears immediately. If Rx buffer is set to auto mode or Rx buffer type is set to raw data, this page will not appear. It consists of 4 function groups: Input, List, Action and Status.

The software automatically saves data of Transmit list when the program is closed. Restart program and the recorded data will be displayed in Transmit list.



- **Input**
  Enter proper parameters and click Add button to add data value into Transmit list. Or you can directly click on each item in Transmit list to update data. All items in Transmit list have default values and protection against out-of-range input data.



Port
This is the same CAN port specified in Connect Setting window.

IDLen
This is message ID type selection; 11-bit(CAN 2.0A) or 29-bit(CAN 2.0B).

ID
This is message ID in hexadecimal.

RTR
Determine whether RTR message is set or not. Note data length of RTR message without data field is 0.

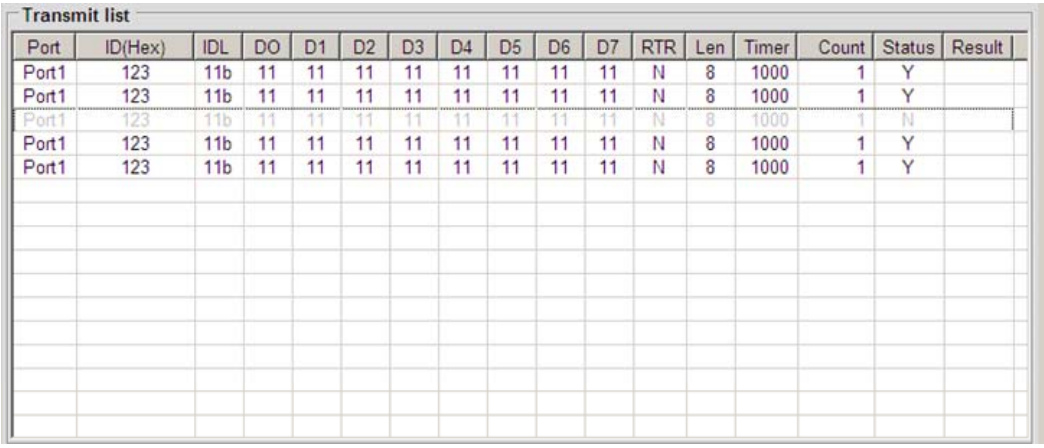
Data Len
Transmit data length.

D0~D7
CAN data in hexadecimal.

(HW) Timer
Transmit interval in millisecond. This item is only suitable for hardware (HW) send.

(HW) Count
Set the number of times the data is transmitted (for hardware (HW) send).

- **Transmit List**
  All added data is filled into below Transmit list.



Transmit list

Port	ID(Hex)	IDL	DO	D1	D2	D3	D4	D5	D6	D7	RTR	Len	Timer	Count	Status	Result
Port1	123	11b	11	11	11	11	11	11	11	11	N	8	1000	1	Y	
Port1	123	11b	11	11	11	11	11	11	11	11	N	8	1000	1	Y	
Port1	123	11b	11	11	11	11	11	11	11	11	N	8	1000	1	N	
Port1	123	11b	11	11	11	11	11	11	11	11	N	8	1000	1	Y	
Port1	123	11b	11	11	11	11	11	11	11	11	N	8	1000	1	Y	

Port
This is the same CAN port specified in Connect Setting window.

ID
This is message ID in hexadecimal.

IDL
This is message ID type selection; 11-bit(CAN 2.0A) or 29-bit(CAN 2.0B).

D0~D7
CAN data in hexadecimal.

RTR
Indicate whether RTR message is set or not.

Len
Transmit data length.

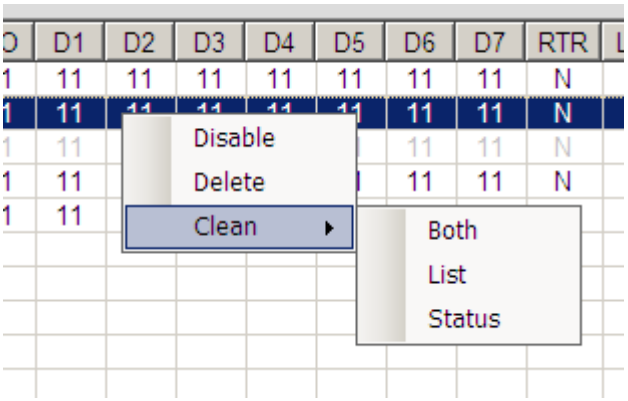
Timer
Transmit interval in millisecond.

Count
The number of times the data is transmitted.

Status
This option is status of whether to transmit data or not. If disabled, data selected in Transmit list will show up in gray and will be ignored during data transmission.

Result
Show result of data transmission. If error occurred, double click (with mouse left button) on list item to display error message box. If no error occurred, you won't see any error message.

Right click on list item to show additional function.



Enable/Disable
Enable or disable selected row.

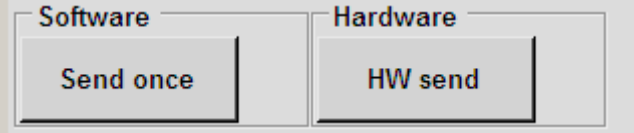
Delete
Delete selected row from list.

Clean\Both
Remove both; data and status data from selected row.

Clean\List
Remove data from selected row.

Clean\Status
Remove status data from selected row.

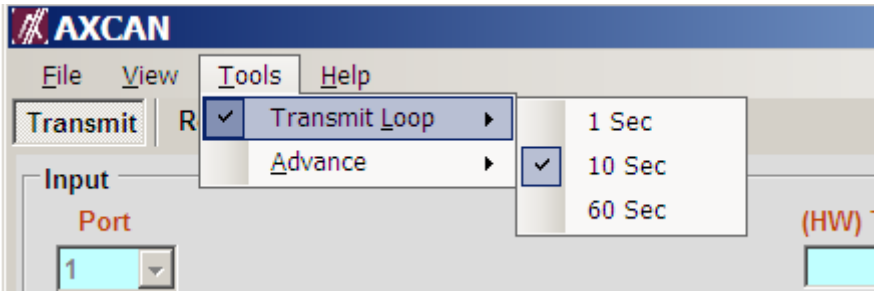
- **Action**



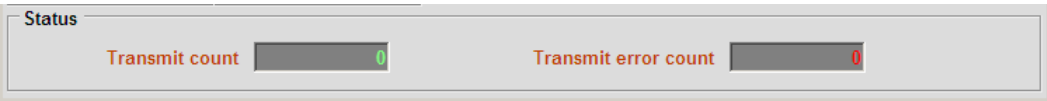
Send once
Click this button to send data in list regardless of (HW) Timer and (HW) Count settings.

HW Send
Click this button to send data in list based on (HW) Timer and (HW) Count settings.

To transmit data continuously, check Tools menu\Transmit Loop\1 or 10 or 60 sec. Then click Send once or HW send button to transmit data repeatedly. The transmitting will not stop until Stop loop button is pressed.



- **Status**

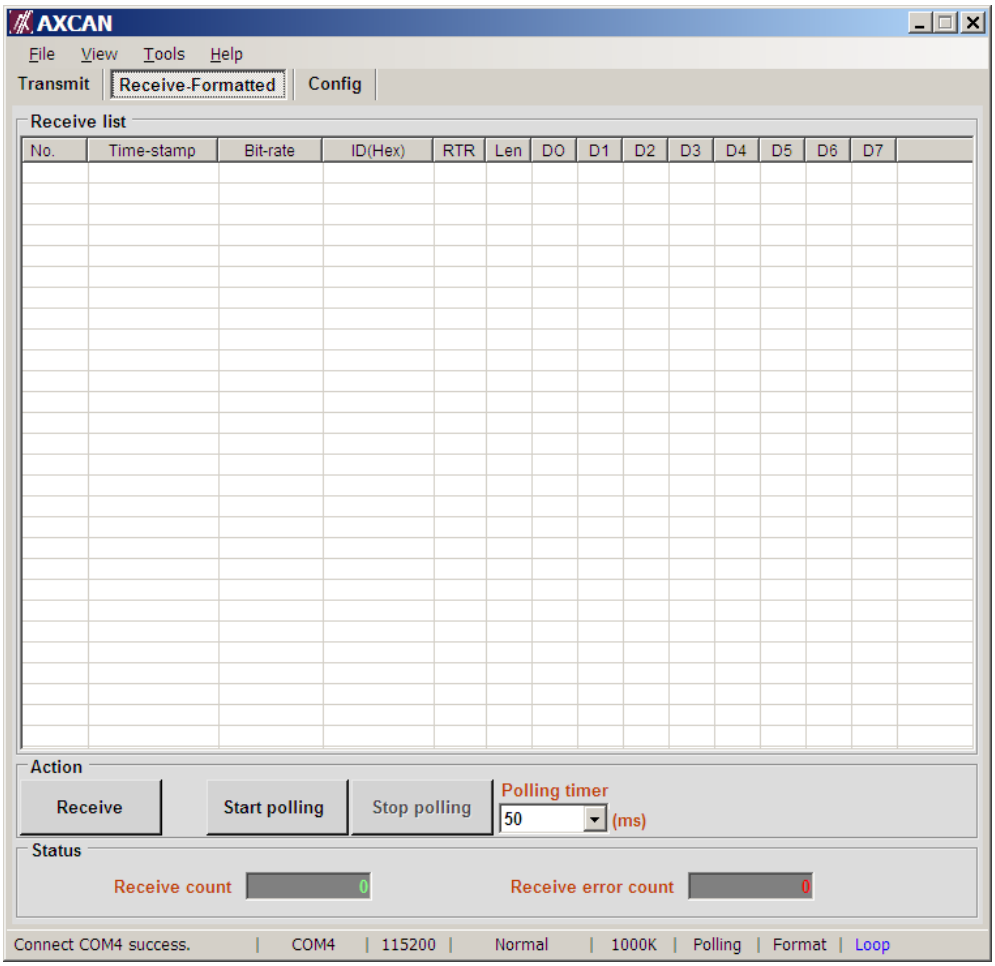


Transmit count
This is the total amount of transmitted data.

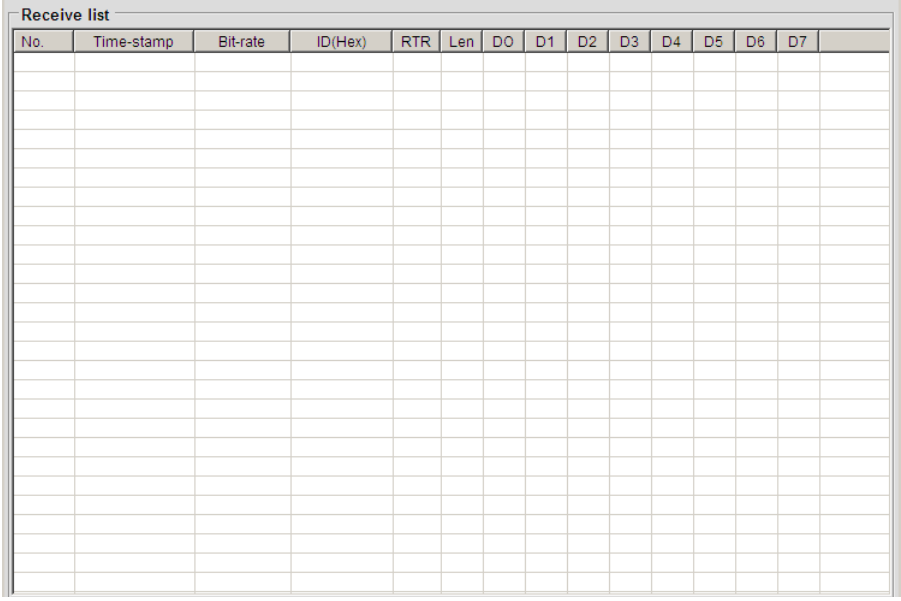
Transmit error count
The amount of transmit errors.

4.4 Receive-Formatted Setting Window

If Rx buffer type is set to formatted data, this page switches to Receive-Formatted Setting page. This page consists of 3 function groups: List, Action and Status.



- **Receive List**
  Received data is shown in this list.



No.
Number of list item.

Time stamp
The time at which message is received by PC.

Bit rate
CAN communication bit rate.

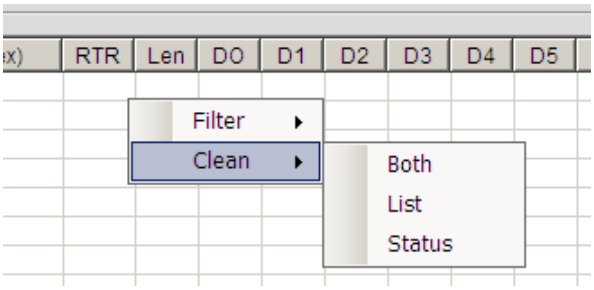
ID
This is message ID in hexadecimal.

RTR
Indicate whether RTR message is set or not.

Len
Receive data length.

D0~D7
CAN data in hexadecimal.

Right click on list item to show additional function.



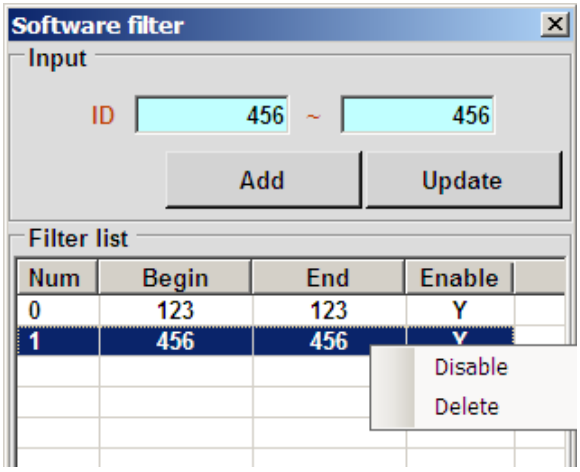
Filter
This function is for software filter setting. More detailed information is given below.

Clean\Both
Remove both; data and status data from selected row.

Clean\List
Remove data from selected row.

Clean\Status
Remove status data from selected row.

Software filter
Adds filters to block out of range values, so only the data in range will be shown in Receive list. The valid range of data is 0~1FFFFFFF (hex).



In addition, there is a right-click menu over the Filter list which allows you to choose Disable or Delete function.

Enable/Disable
Enable or disable range filter.

Delete
Remove the selected range filter.

- **Action**
  When the Rx buffer is in Polling mode, the Action page appears as follow.

When the Rx buffer is in Auto mode, the Action page appears as follow.

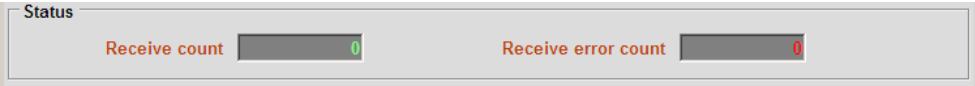
Receive
Click this button to request device to send data.

Start polling
Click this button to start polling. It requests device to send data continuously based on time interval in Polling timer.

Stop polling
Click this button to stop polling.

Stop auto-mode
Click this button to stop Auto mode and switch back to Polling mode.

- **Status**

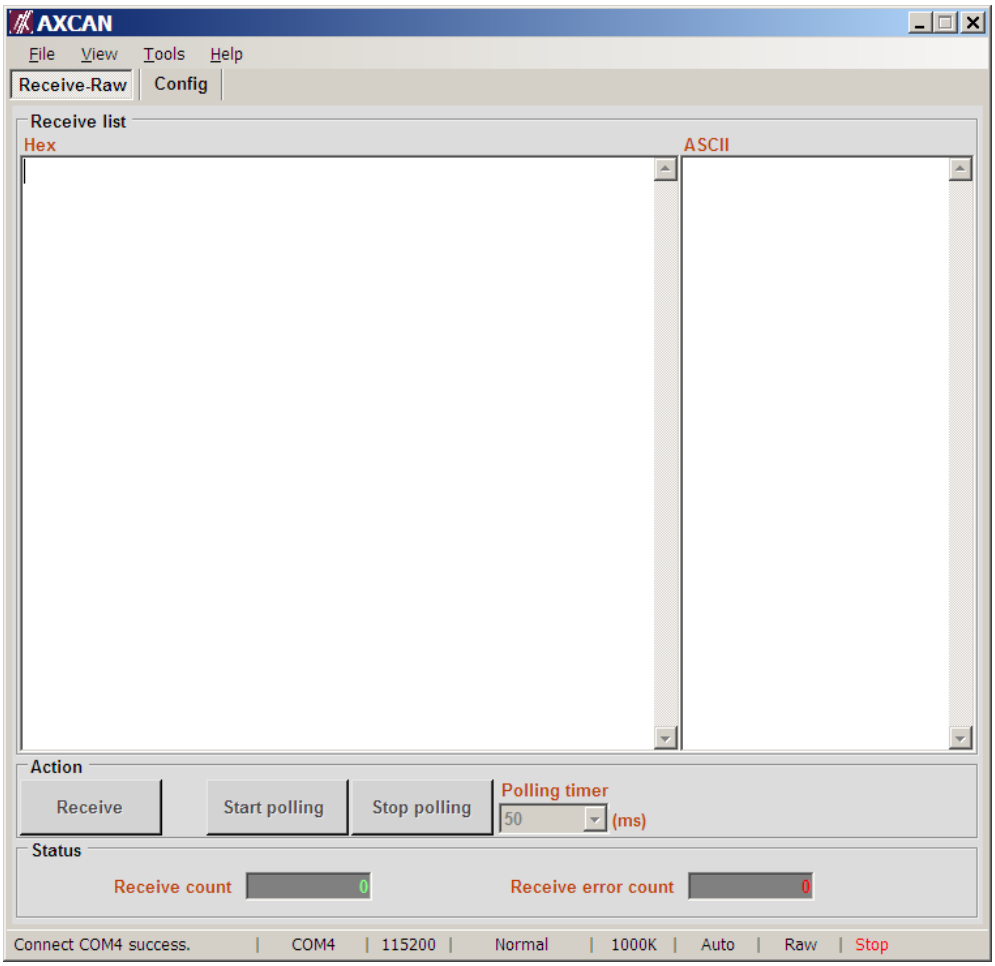


Receive count
This is the total amount of received data.

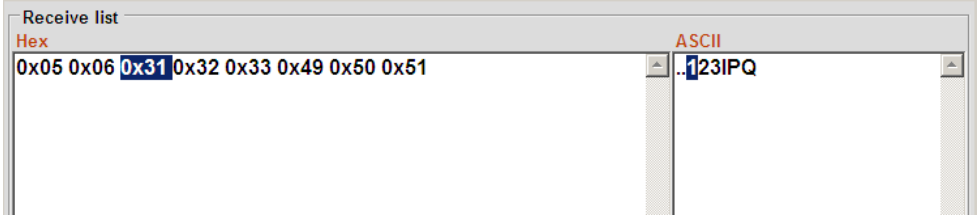
Receive error count
The amount of receive errors.

4.5 Receive-Raw Setting Window

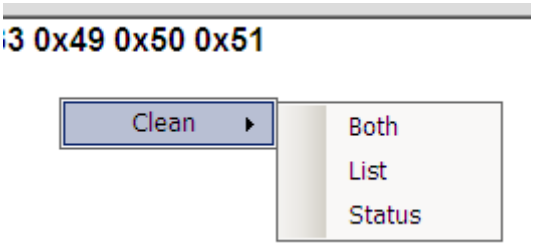
If Rx buffer type is set to raw data, this page switches to Receive-Raw Setting page. This page consists of 3 function groups: List, Action and Status.



- List
  Received raw data (in hexadecimal and ASCII) is shown in this list.



Select Hex data and at the same time its corresponding ASCII data is also selected. Conversely, if you select ASCII data, its mapped Hex data is also selected. In addition, there is a right-click menu over the Receive list which allows you to use Clean function.

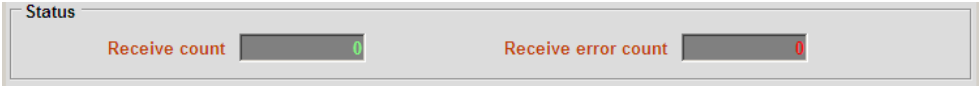


Clean\Both
Remove both; selected data and status of received data.

Clean\List
Remove selected data.

Clean\Status
Remove status of received data.

- **Status**

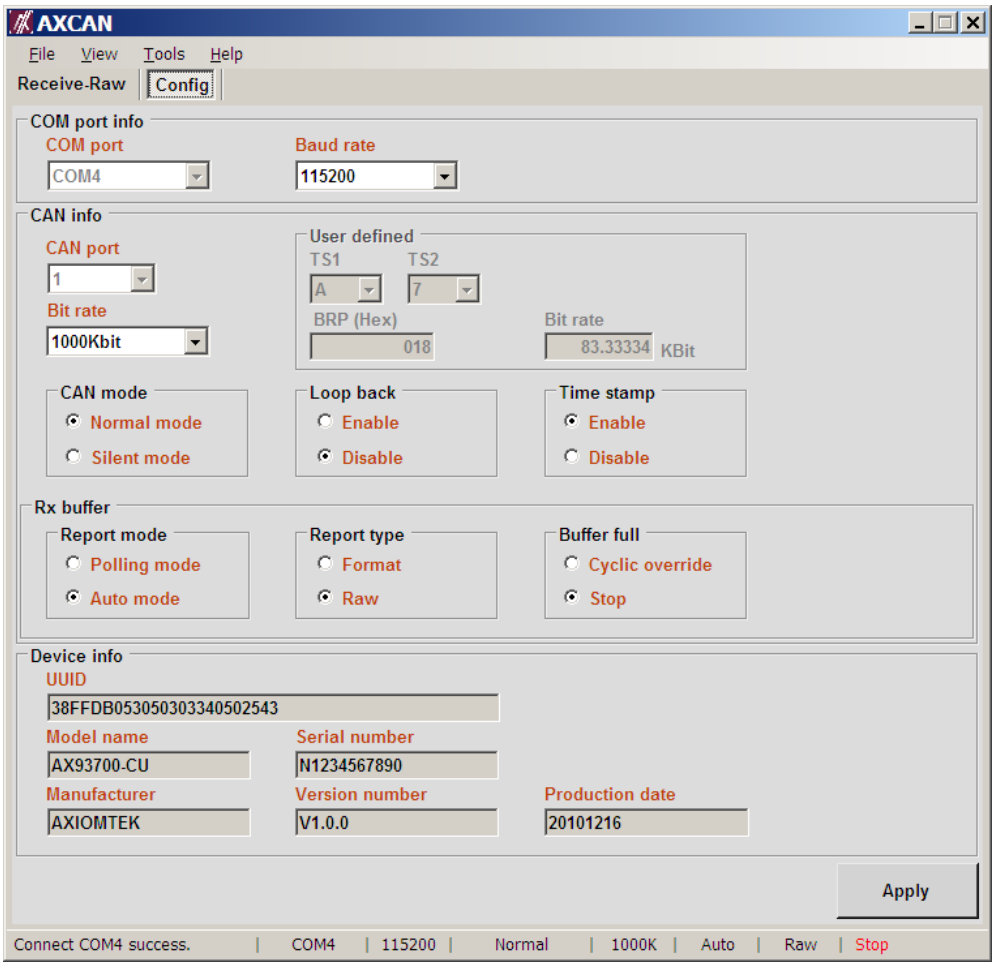


Receive count
This is the total amount of received data.

Receive error count
The amount of receive errors.

4.6 Config Setting Window

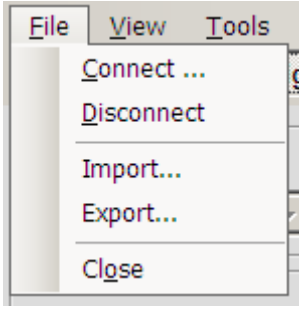
You can use functions in this window only if the connection is successful. This page consists of 2 function groups: Setting (refer to section 4.2 Connect Setting Window) and Device info.



- **Device info**
  It contains the following information: UUID, Model name, Serial number, Manufacturer, Version number and Production date.

4.7 Others

- **File Menu**



Connect
Click File\Connect menu to launch Connect window.

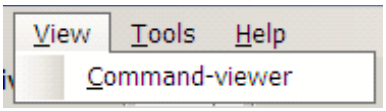
Disconnect
Click File\Disconnect menu to terminate current connection.

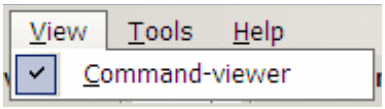
Import
Click File\Import menu to import setting file.

Export
Click File\Export menu to store current settings into a file.

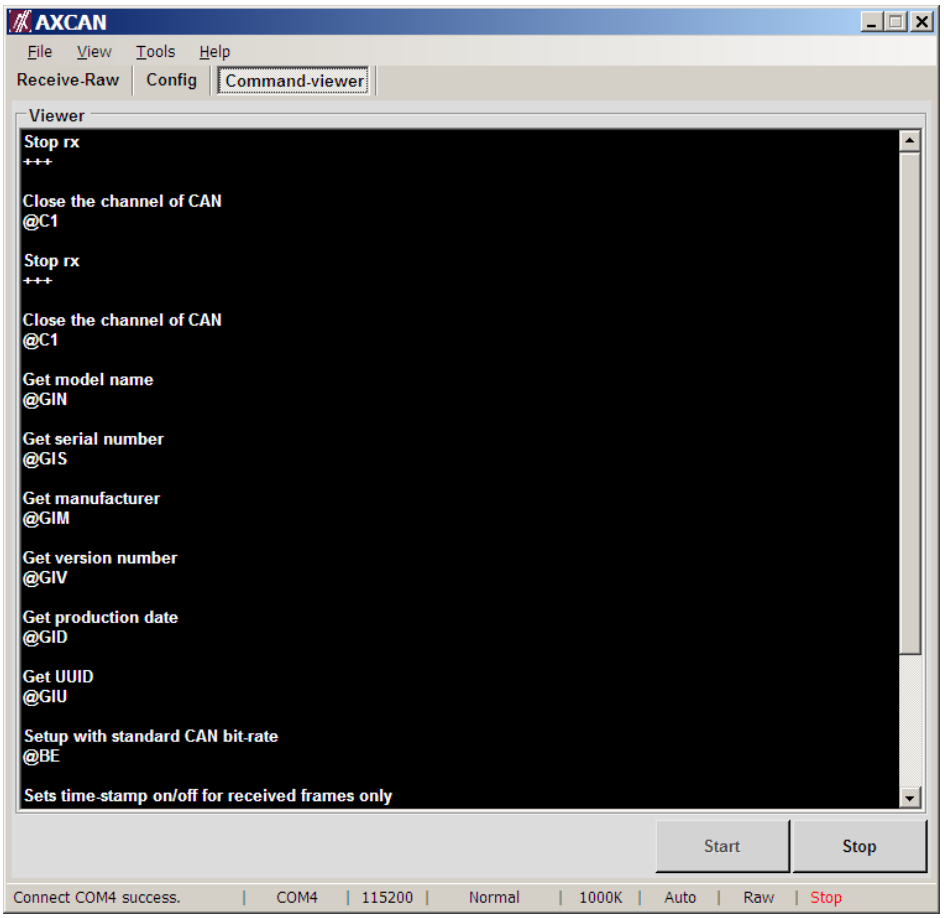
Close
Click File\Close menu to exit program.

- **View Menu**



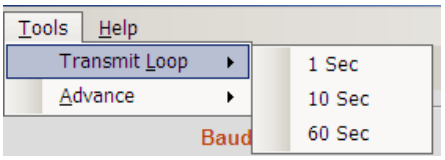


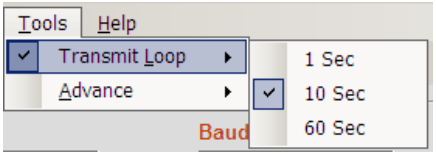
Click View\Command-viewer menu to open Command-viewer window. After the window is opened successfully, the Command-viewer item will be checked automatically.



- **Tools Menu**

Transmit Loop

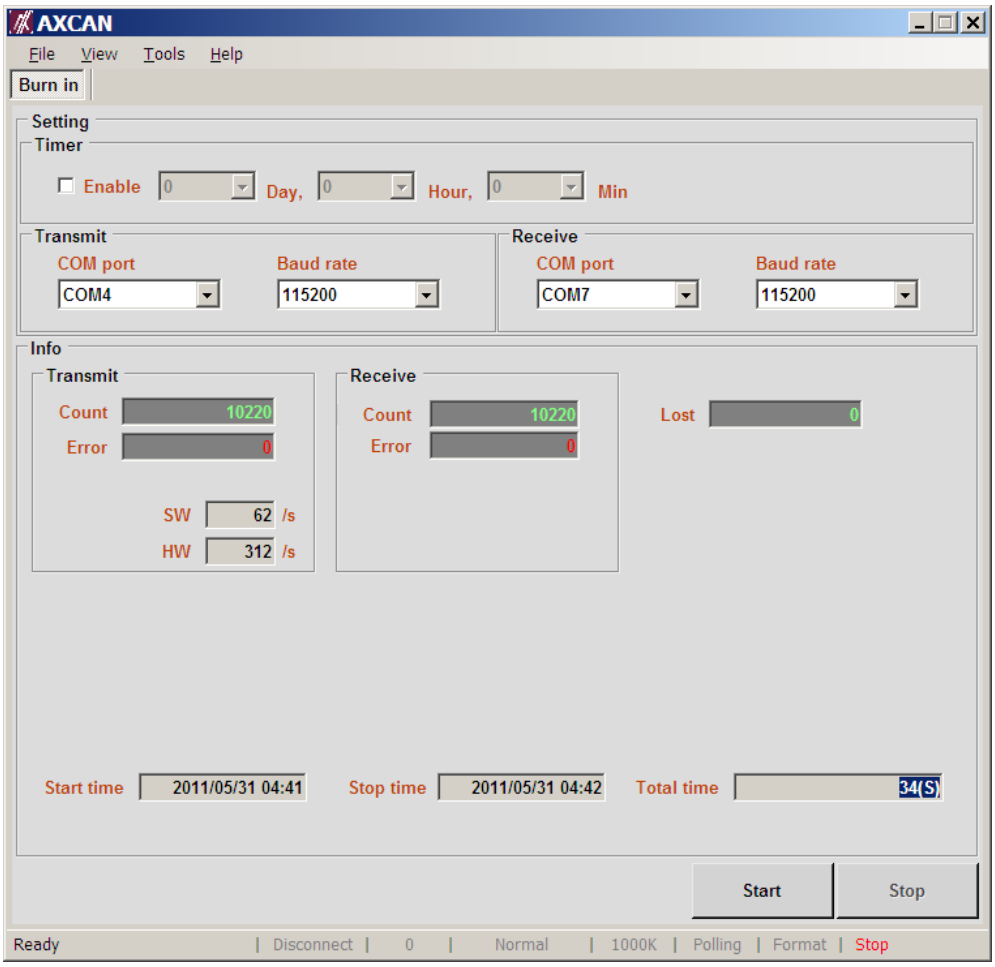




Select Tools\Transmit Loop\1 or 10 or 60 sec to trigger transmit loop function. After transmit loop has started, a check sign is added simultaneously.

Test Mode

Click Tools\Advance\Test mode to trigger burn in operation.



Timer
Enter timer value using the Day, Hour and Minute combo box. You can enable/disable the time duration of device testing. If this timer is enabled, the device testing stops at the end of the time duration. Or you can press Stop button to terminate immediately. If this timer is disabled, the device testing terminates only when Stop button is pressed.

Transmit and Receive
Please refer to section 4.2 Connect Setting Window.

Info\Transmit\Count
This is the total amount of transmitted data.

Info\Transmit\Error
The amount of transmit errors.

Info\Transmit\SW
This is the total amount of transmitted data per second via software (from USB port to device).

Info\Transmit\HW
This is the total amount of transmitted data per second via hardware (from device to device).

Info\Receive\Count
This is the total amount of received data.

Info\Receive\Error
The amount of receive errors.

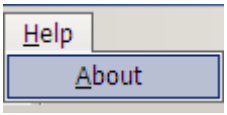
Info\Lost
This is the total amount of messages lost.

Info\Start time
This is the start time information.

Info\Stop time
This is the stop time information.

Info\Total time
This is the total amount of burn in time.

- **Help Menu**



Help\About
Click Help\About menu to display About AXCAN window.

Chapter 5
Commands Available

5.1 Overview

To meet user's application purpose, commands are provided for CAN module management, transmitting and receiving messages through iCON-101CS. Each command consists of 3 parts: StartByte, ContentOfCommand and StopByte.

StartByte	ContentofCommand	StopByte
@	CMD	0x0d (carriage return)

Operation can be set to command and data mode. In command mode, CAN module accepts commands and this is the default mode. Data mode is the mode that only and automatically report CAN messages to UART port or USB port based on settings until user inputs command string '+++'.

Command Mode
In general, CAN module stays at command mode as default and accepts all commands.

Data Mode
Once CAN port is opened in auto report mode, it enters data mode and doesn't accept any command input except string '+++' in order to switch from data mode back to command mode.

5.2 Summary Table of All Commands

No.	Command	Description
1	Un	Set UART baud rate, where n is 0~A (Default: U7).
2	Bn	Set CAN bit rate, where n is 0~E and M (Default: BE).
3	Bxyzzz	Set TS1, TS2 and BRP parameters for user-defined CAN bit rate, where x ,y and zzz are in hexadecimal.
4	Sx	Set report method, data format and receiving behavior if buffer is full (Default: S0).
5	Onxy	Open CAN port n with arguments x and y.
6	Cn	Close CAN port n.
7	Tnpppprrrriiildd…	Transmit 2.0A CAN messages without RTR through CAN port n.
8	tnpppprrrriii0R	Transmit 2.0A CAN messages with RTR bit 1 through CAN port n.
9	Tnpppprrrriiiiiiiildd…	Transmit 2.0B CAN messages without RTR through CAN port n.
10	Tnpppprrrriiiiiiii0R	Transmit 2.0B CAN messages with RTR bit 1 through CAN port n.
11	Tx	Inform CAN controller to stop transmitting messages if repeat counter is not zero.
12	Fnnxi..i	Set acceptance filter as identifier list mode.
13	Mnnxi..i	Apply mask mode to specified acceptance filter.
14	Wppxxxllldd…	Write data to NVRAM (64Kbyte in total).
15	Rppxxxlll	Read data from NVRAM.
16	Eppxxxlll	Erase NVRAM.
17	SC	Save settings to NVRAM.
18	Zn	Enable timestamp of received messages.
19	SITnx	Configure termination of specified CAN port.
20	GITn	Read termination setting of specified CAN port.
21	SIEx	Configure the CAN Error LED.
22	+++	Escape from data mode to command mode.
23	SIB+++	Reset CAN interface (module).
24	GIx	Retrieve CAN system information.
25	Gx	Retrieve current CAN status and settings.
26	SRTnx	Set termination of specified COM port (iCON101-CS only).
27	SRMnx	Set OP mode of specified COM port (iCON101-CS only).
28	SREn	Activate SRTnx and SRMnx (iCON101-CS only).
29	GRTn	Read termination of specified COM port (iCON101-CS only).
30	GRMn	Read OP mode of specified COM port (iCON101-CS only).

1. Command: Un

Command	**Un**
Description	Set UART baud rate, where n is 0~A (Default: U7). ■ This command is only available in command mode.
Arguments	@U0: 1200 bps @U1: 2400 bps @U2: 4800 bps @U3: 9600 bps @U4: 19200 bps @U5: 38400 bps @U6: 57600 bps @U7: 115200 bps @U8: 230400 bps @U9: 460800 bps @UA: 921600 bps
Example	@U6 Set UART baud rate to 57600 bps.
Return	OK or ERRORxx
Others	None

2. Command: Bn

Command	**Bn**
Description	Set CAN bit rate, where n is 0~E and M (Default: BE). ■ This command is only available in command mode. ■ This command must be used prior to open CAN port.
Arguments	@B0: 5 Kbit @B1: 10 Kbit @B2: 20 Kbit @B3: 40 Kbit @B4: 50 Kbit @B5: 80 Kbit @B6: 100 Kbit @B7: 125 Kbit @B8: 200 Kbit @B9: 250 Kbit @BA: 400 Kbit @BB: 500 Kbit @BC: 600 Kbit @BD: 800 Kbit @BE: 1000 Kbit @BM: User-defined
Example	@B4 Set CAN bit rate to 50 Kbit.
Return	OK or ERRORxx
Others	None

3. Command: bxyzzz

Command	**bxyzzz**
Description	Set TS1, TS2 and BRP parameters for user-defined CAN bit rate, where x ,y and zzz are in hexadecimal. ■ This command is only available in command mode. ■ This command must be used prior to open CAN port.
Arguments	x: TS2 (Time Segment 2), its data range is from 1 to 7. y: TS1 (Time Segment1), its data range is from 1 to F. zzz: BRP (Baud Rate Prescaler), its data range is from 1 to 3FF. Bit-rate = Fcl/(BRP(TS1+TS2+1)), where Fcl=36MHz.
Example	@b16012 Set TS2=0x1, TS1=0x6 and BRP=0x12, and calculate according to above formula. Result is the user-defined CAN bit rate = 250Kbit.
Return	OK or ERRORxx
Others	None

4. Command: Sx

Command	**Sx**
Description	Set report method, data format and receiving behavior if buffer is full (Default: S0). ■ This command is only available in command mode.
Arguments	x: Its data range is from 0 to 7 in hexadecimal. Bit[0]: Report method 0: Polling; report one message per polling 1: Auto; report automatically Bit[1]: Data format 0: Report formatted data 1: Report raw data Bit[2]: Receiving behavior if buffer is full. 0: Overwrite the old data 1: Suspend receiving until receiving space is available
Example	@S5 Set CAN to auto-report, report formatted data and overwrite buffer if it is full.
Return	OK or ERRORxx
Others	None

5. Command: Onxy

Command	Onxy
Description	Open CAN port n with arguments x and y. ■ This command is only available in command mode. ■ Before using this command, please make sure that the CAN port has been initialized via @Bn or @bxyzzz command.
Arguments	n: CAN port number, only 1 is allowed for AX93700 and iCON101 series. x: Enable\disable silent mode. Set\unset CAN port as transmit-only. 0: Disable silent mode. This is the default normal mode. 1: Enable silent mode. CAN port is not allowed to receive messages. y: Enable\disable loopback mode. 0: Disable loopback mode 1: Enable loopback mode
Example	@O101 Open CAN port 1 and set it to operate at normal mode with loopback.
Return	OK or ERRORxx
Others	None

6. Command: Cn

Command	Cn
Description	Close CAN port n ■ This command is only available in command mode.
Arguments	n: CAN port number, only 1 is allowed for AX93700 and iCON101 series.
Example	@C1 Close CAN port 1
Return	OK or ERRORxx
Others	None

7. Command: tnpppprrrriiildd...

Command	**tnpppprrrriiildd...**
Description	Transmit 2.0A CAN messages without RTR through CAN port n. ■ This command is only available in command mode. ■ Command is available only if CAN port has opened.
Arguments	n: CAN port number, only 1 is allowed for AX93700 and iCON101 series. pppp: Transmission intervals in hexadecimal. Its range is 0000~FFFF. Send one CAN message every pppp * 0.1 ms for rrrr times. Unit: 100 us (0.1 ms). rrrr: Repeat counter in hexadecimal. Its range is 0000~FFFF. 0000: Send once iii: Identifier in hexadecimal. Its range is 000~7FF. l: Data length in hexadecimal. Its range is 0~8. dd: One data byte in hexadecimal. Its range is 00~FF. dd fields must match the setting of data length l.
Example 1	@t10000000010021133 Send one 2.0A CAN message with 11-bit ID 0x100, 2 bytes data 0x11 and 0x33 through CAN port 1.
Example 2	@t100010005002133 Send one 2.0A CAN message with 11-bit ID=0x002 and 1 byte data 0x33 every 0.1ms for 5 times through CAN port 1.
Return	OK or ERRORxx
Others	The @GR command can be used to pull data out of receive buffer.

8. Command: tnpppprrrriii0R

Command	**tnpppprrrriii0R**
Description	Transmit 2.0A CAN messages with RTR bit 1 through CAN port n. ■ This command is only available in command mode. ■ Command is available only if CAN port has opened.
Arguments	n: CAN port number, only 1 is allowed for AX93700 and iCON101 series. pppp: Transmission intervals in hexadecimal. Its range is 0000~FFFF. Send one CAN message every pppp * 0.1 ms for rrrr times. Unit: 100 us (0.1 ms). rrrr: Repeat counter in hexadecimal. Its range is 0000~FFFF. 0000: Set repeat counter to one. iii: Identifier in hexadecimal. Its range is 000~7FF.
Example	@t1000000011000R Send one 2.0A CAN message with 11-bit ID 0x100 and RTR bit 1 through CAN port 1. Note this command sends message without data field which means the data length is zero.
Return	OK or ERRORxx
Others	The @GR command can be used to pull data out of receive buffer.

9. Command: Tnpppprrrriiiiiiiildd...

Command	**Tnpppprrrriiiiiiiildd...**
Description	Transmit 2.0B CAN messages without RTR through CAN port n. ■ This command is only available in command mode. ■ Command is available only if CAN port has opened.
Arguments	n: CAN port number, only 1 is allowed for AX93700 and iCON101 series. pppp: Transmission intervals in hexadecimal. Its range is 0000~FFFF. Send one CAN message every pppp * 0.1 ms for rrrr times. Unit: 100 us (0.1 ms). rrrr: Repeat counter in hexadecimal. Its range is 0000~FFFF. 0000: Send once iiiiiiii: Identifier in hexadecimal. Its range is 00000000~1FFFFFFF. l: Data length in hexadecimal. Its range is 0~8. dd: One data byte in hexadecimal. Its range is 00~FF. dd fields must match the setting of data length l.
Example 1	@T100000000000456783616265 Send one 2.0B CAN message with 29-bit ID 0x00045678, 3 bytes data 0x61, 0x62 and 0x65 through CAN port 1.
Example 2	@T100010005010203043212223 Send one 2.0B CAN message with 29-bit ID=0x01020304 and 3 bytes data 0x21, 0x22 and 0x23 every 0.1ms for 5 times through CAN port 1.
Return	OK or ERRORxx
Others	The @GR command can be used to pull data out of receive buffer.

10. Command: Tnpppprrrriiiiiiii0R

Command	**Tnpppprrrriiiiiiii0R**
Description	Transmit 2.0B CAN messages with RTR bit 1 through CAN port n. ■ This command is only available in command mode. ■ Command is available only if CAN port has opened.
Arguments	n: CAN port number, only 1 is allowed for AX93700 and iCON101 series. pppp: Transmission intervals in hexadecimal. Its range is 0000~FFFF. Send one CAN message every pppp * 0.1 ms for rrrr times. Unit: 100 us (0.1 ms). rrrr: Repeat counter in hexadecimal. Its range is 0000~FFFF. 0000: Set repeat counter to one. iiiiiiii: Identifier in hexadecimal. Its range is 00000000~1FFFFFFF.
Example	@T100000000123456780R Send one 2.0B CAN message with 29-bit ID 0x12345678 and RTR bit 1 through CAN port 1. Note this command sends message without data field, which means the data length is zero.
Return	OK or ERRORxx
Others	The @GR command can be used to pull data out of receive buffer.

11. Command: Tx

Command	**Tx**
Description	Inform CAN controller to stop transmitting messages if repeat counter is not zero. ■ This command is only available at command mode. ■ Command is available only if CAN port has been opened.
Arguments	None
Example	@Tx Stop transmitting if repeat counter is not zero.
Return	OK or ERRORxx
Others	None

12. Command: Fnnxi..i

Command	**Fnnxi..i**
Description	Set acceptance filter as identifier list mode. ■ This command is only available in command mode. ■ Command is available only if CAN port is not opened.
Arguments	nn: Index of filter in hexadecimal. Its data range is 00~1B. x: Format of identifier. Its data range is 0~1. 0: Standard ID (11-bit) 1: Extend ID (29-bit) i..i: Identifier
Example 1	@F000111 Set filter index 0 as identifier list mode for and accept identifier 0x111 only.
Example 2	@F00112345678 Set filter index 0 as identifier list mode for and accept identifier 0x12345678 only.
Returns	OK or ERRORxx
Others	■ Remember to close CAN port with the @C1 before using this command. ■ Filter index 0x0 has been set as mask mode with identifier id 0 by default. If you want to enable some filters at identifier list mode, please do remember to set index to any other value except 0x00. Otherwise, messages won't be filtered out because of this default mask mode filter. ■ For more detailed information, please refer to section 5.3 Identifier Filtering.

13. Command: Mnnxi..i

Command	Mnnxi..i
Description	Apply mask mode to specified acceptance filter. ■ This command is only available in command mode. ■ Command is available only if CAN port is opened.
Arguments	nn: Index of filter in hexadecimal. Its data range is 00~1B. x: Format of identifier. Its data range is 0~1. 0: Standard ID (11-bit) 1: Extend ID (29-bit) i..i: Identifier mask value 0: Don't care. The bit of identifier is not used for comparison. 1: Must match. The bit of the incoming identifier must have the same level.
Example	@F000123 and @M000FF0 combination. Set standard acceptance identification #0; only accepts incoming messages with identifiers from range 0x120 to 0x12F.
Returns	OK or ERRORxx
Others	■ Remember to close CAN port with the @C1 command before applying mask mode. ■ Filter index 0x0 has been set as mask mode with identifier id 0 by default. If you want to enable some filters at identifier list mode, please do remember to set index to any other value except 0x00. Otherwise, no message will be filtered out because of this default mask mode filter. ■ For more detailed information, please refer to section 5.3 Identifier Filtering.

14. Command: Wppxxxlllldd…

Command	Wppxxxlllldd…
Description	Write data to NVRAM (64Kbyte in total) ■ This command is only available in command mode. ■ Command is available only if CAN port is not opened.
Arguments	pp: Number of page (2KB/page) written in hexadecimal. Its data range is 00~1F. xxx: Offset in hexadecimal. Its data range is 000~7FF. lll: Data length in hexadecimal. Its data range is 001~800. dd: Data byte in hexadecimal. Its data range is 00~FF. Note dd must repeat for lll times.
Example 1	@ W00000002AA55 Write 2 bytes of data 0xAA and 0x55 to NVRAM at page 0 with offset 0x0.
Example 2	@W030600053132333435 Write 5 bytes of data 0x31, 0x32, 0x33, 0x34 and 0x35 to NVRAM at page 03 with offset 0x060.
Returns	OK or ERRORxx
Others	None

15. Command: Rppxxxlll

Command	**Rppxxxlll**
Description	Read data from NVRAM. ■ This command is only available in command mode. ■ Command is available only if CAN port is not opened.
Arguments	pp: Number of page (2KB/page) written in hexadecimal. Its data range is 00~1F. xxx: Offset in hexadecimal. Its data range is 000~7FF. lll: Data length in hexadecimal. Its data range is 001~800.
Example 1	@ R00000002 Read 2 bytes from of NVRAM at page 0 with offset 0x0.
Example 2	@R03060005 Read 5 bytes from NVRAM at page 03 with offset 0x060.
Others	Note the return value will display in hexadecimal with ‘R’ as prefix character.

16. Command: Eppxxxlll

Command	**Eppxxxlll**
Description	Erase NVRAM ■ This command is only available in command mode. ■ Command is available only if CAN port is not opened.
Arguments	pp: Number of page (2KB/page) written in hexadecimal. Its data range is 00~1F. xxx: Offset in hexadecimal. Its data range is 000~7FF. lll: Data length in hexadecimal. Its data range is 001~800.
Example	@ E00000002 Erase 2 bytes of NVRAM from page 0 with offset 0x0.
Returns	OK or ERRORxx
Others	Note the return value will display in hexadecimal with ‘R’ as prefix character.

17. Command: SC

Command	**SC**
Description	Save settings to NVRAM. The settings include: 1. TimeStamp. 2. Data report method of CAN port. 3. Receiving behavior if buffer is full. 4. Enable/disable timestamp information (refer to @Zn command) 5. Baudrate of COM port ■ This command is only available in command mode.
Arguments	None
Example	@SC
Returns	OK or ERRORxx
Others	None

18. Command: Zn

Command	**Zn**
Description	Enable timestamp of received messages. ■ This command is only available in command mode. ■ Command is available only if CAN port is not opened.
Arguments	n: Enable/disable timestamp 0: Disable (default) 1: Enable
Example	@Z0 Disable timestamp.
Returns	OK or ERRORxx
Others	None

19. Command: SITnx

Command	**SITnx**
Description	Configure termination of specified CAN port. ■ This command is only available in command mode.
Arguments	n: CAN port number x: Enable/disable termination 0: Disable termination 1: Enable termination
Example	@SIT11 Enable termination of CAN port 1.
Returns	OK or ERRORxx
Others	This command applies only to iCON101 series.

20. Command: GITn

Command	**GITn**
Description	Read termination setting of specified CAN port. ■ This command is only available in command mode.
Arguments	n: CAN port number
Example	@GIT1 Must return #T0 or #T1.
Returns	#T0(Disabled) or #T1(Enabled)
Others	This command applies only to iCON101 series.

21. Command: SIEx

Command	**SIEx**
Description	Configure the CAN Error LED. ■ This command is only available in command mode.
Arguments	x: Turn on/off CAN Error LED. 0: Turn off 1: Turn on
Example	@SIE0 Turn off the CAN Error LED.
Returns	OK or ERRORxx
Others	None

22. Command: +++

Command	**+++**
Description	Escape from data mode to command mode. ■ This command is only available in data mode.
Arguments	None
Example	+++ Escape from data mode to command mode
Returns	None
Others	After sending characters '+++', user can send 0x0d carriage return to see whether string '#OK' shows on terminal or not. If '#OK' appears, it means device is already in command mode.

23. Command: SIB+++

Command	**SIB+++**
Description	Reset CAN interface (module). ■ This command is only available in command mode.
Arguments	None
Example	@SIB+++ Module reboots.
Returns	Rebooting…!
Others	None

24. Command: GIx

Command	**GIx**
Description	Retrieve CAN system information. ■ This command is only available in command mode.
Arguments	x: Its definition is as follows: N: Model name S: Serial number U: Unique ID(UUID) M: Manufacturer V: Version D: Production Date
Example	@GIV Retrieve version information.
Returns	V2.1.2
Others	None

25. Command: Gx

Command	**Gx**
Description	Retrieve current CAN status and settings. ■ This command is only available in command mode.
Arguments	x: Its definition is as follows: -O: Retrieve open mode settings of CAN port for comparing with the settings of @Onxy command. -U: Retrieve current baud rate of COM port for comparing with the setting of @Un command. -B: Retrieve current bit rate of CAN port for comparing with the setting of @Bn command. -S: Retrieve settings of CAN for comparing with the settings of @Sx command. -Fnn: Retrieve settings of acceptance filter (list mode) nn for comparing with the settings of @Fnnxiii… command. -Mnn: Retrieve settings of acceptance filter (mask mode) nn for comparing with the settings of @Mnnxiii… command. -Z: Retrieve setting of timestamp for comparing with the setting of @Zn command. -R: Retrieve one message out of receive buffer. -E: Retrieve the latest error code.
Returns	@GO: Refer to command description for more details, e.g.: O100. @GU: U1200, U2400, U4800, U9600, U19200, U38400, U57600, U115200, U230400, U460800 or U921600. @GB: Refer to command description for more details, e.g.: B0, B1…or B7. @GS: Refer to command description for more details, e.g.: S0, S1…or S7. @GFnn: Refer to command description for more details. @GMnn: Refer to command description for more details. @GZ: Refer to command description for more details, e.g.: Z0 or Z1. @GR: Please refer to section 5.4 Data Format for details. @GE: A prefix character of ‘E’ plus a 4-byte value indicate the latest error status. Bit[24:31] : REC - Receive Error Counter. Bit[16:23] : TEC - Transmit Error Counter. Bit[07:15] : Reserved. Bit[04:06] : LEC - Last Error Code. 000: No error. 001: Stuff error. 010: Form error. 011: Acknowledgment error. 100: Bit recessive error. 101: Bit dominant error. 110: CRC error. 111: Reserved. Bit[3] : Reserved. Bit[2] : Bus off flag. Bit[1] : Error passive flag (REC > 127 or TEC > 127). Bit[0] : Error warning flag (REC >= 96 or TEC >= 96).
Others	None

26. Command: SRTnx

Command	**SRTnx**
Description	Set termination of specified COM port. ■ This command is only available in command mode. ■ In RS232 mode, you can't enable termination. ■ This command must be used with SREn. ■ For iCON101-CS only.
Arguments	n: COM port number, only 1 is allowed for AX93700 and iCON101 series. x: Enable/disable termination. 0: Disable termination. 1: Enable termination.
Example	@SRT11 @SRE1 Enable termination of COM1.
Returns	OK or ERRORxx
Others	None

27. Command: SRMnx

Command	**SRMnx**
Description	Set OP mode of specified COM port. ■ This command is only available in command mode. ■ This command must be used with SREn. ■ For iCON101-CS only.
Arguments	n: COM port number, only 1 is allowed for AX93700 and iCON101 series. x: OP mode 0: RS232 1: RS422 2: RS485
Example	@SRM10 @SRE1 Set COM1 to RS232 mode.
Returns	OK or ERRORxx
Others	None

28. Command: SREn

Command	**SREn**
Description	Activate SRTnx and SRMnx. ■ This command is only available in command mode. ■ This command must be used with SRTnx and SRMnx. ■ For iCON101-CS only.
Arguments	n: COM port number, only 1 is allowed for AX93700 and iCON101 series.
Example	@SRT11 @SRM11 @SRE1 Set COM1 to RS422 mode and enable termination of COM1. At last activate it.
Returns	OK or ERRORxx
Others	None

29. Command: GRTn

Command	**GRTn**
Description	Read termination of specified COM port. ■ This command is only available in command mode. ■ For iCON101-CS only.
Arguments	n: COM port number, only 1 is allowed for AX93700 and iCON101 series.
Example	@GRT1 Get termination status of COM1.
Returns	T0
Others	None

30. Command: GRMn

Command	**GRMn**
Description	Read OP mode of specified COM port. ■ This command is only available in command mode. ■ For iCON101-CS only.
Arguments	n: COM port number, only 1 is allowed for AX93700 and iCON101 series.
Example	@GRM1 Get OP mode of COM1.
Returns	M0
Others	None

5.3 Identifier Filtering

Each CAN port provides 14 configurable identifier filters for selecting the incoming message the software needs and discarding the others. Filters can be configured in mask mode or in identifier list mode.

Mask mode
In mask mode the identifier registers are associated with mask registers specifying which bits of the identifier are handled as “must match” or as “don’t care”.

Identifier list mode
In identifier list mode, the mask registers are used as identifier registers. Thus instead of defining an identifier and a mask, two identifiers are specified, doubling the number of single identifiers. All bits of the incoming identifier must match the bits specified in the filter registers.

Note: ***Filter index 0x0 has been set as mask mode with identifier id 0 by default, which means all CAN messages will not be filtered out.***

5.4 Data Format

Raw Data:

Raw data in hexadecimal

Formatted Data:

Standard CAN 2.0A

Byte	**1**	**1**	**4**	**1**	**3**	**1**	**1**	**Data Len*2**	**1**
	@	F	stamp	0	ID	RTR	Data Len	Data	0x0D

Extended CAN 2.0B

Byte	**1**	**1**	**4**	**1**	**3**	**1**	**1**	**Data Len*2**	**1**
	@	F	stamp	1	ID	RTR	Data Len	Data	0x0D

5.5 Error Code

Error No.	Error Code	Description
0	OK	No error.
1	ERROR01	CAN has already been opened.
2	ERROR02	Error detected in opening CAN port.
3	ERROR03	CAN is not open.
4	ERROR04	CAN bit time is not set.
5	ERROR05	CAN Tx buffer is full.
6	ERROR06	CAN buffer is empty.
7	ERROR07	CAN device does not exist.
8	ERROR08	Command error.
9	ERROR09	Flash error.
10	ERROR10	Argument error.

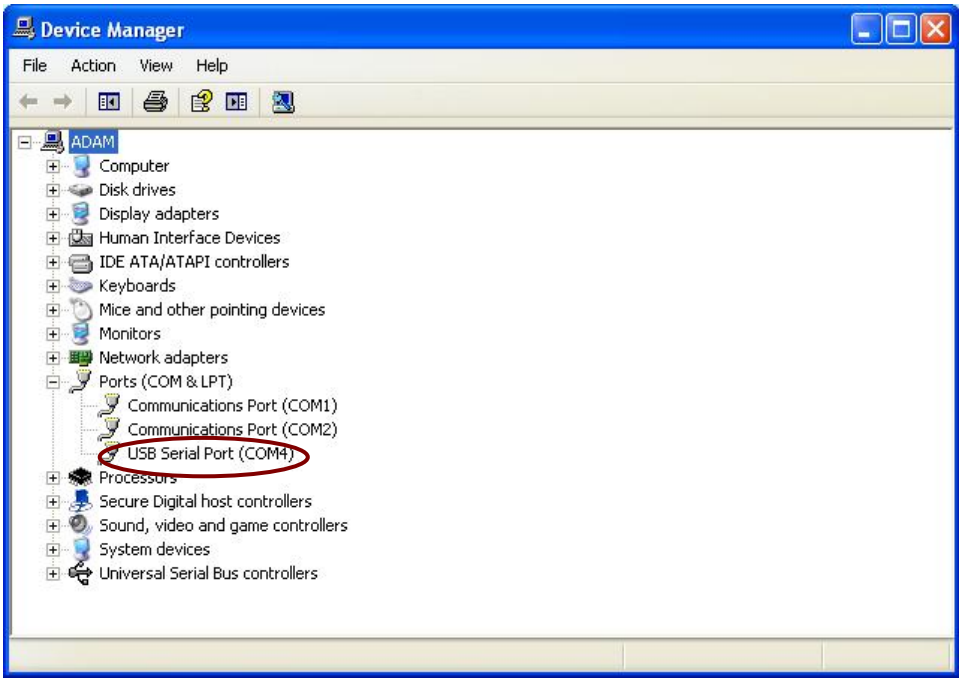
5.6 How to Send Commands via Hyperterminal

You can use hyperterminal program to send and retrieve command messages from iCON-101CS. Before you start, please do:

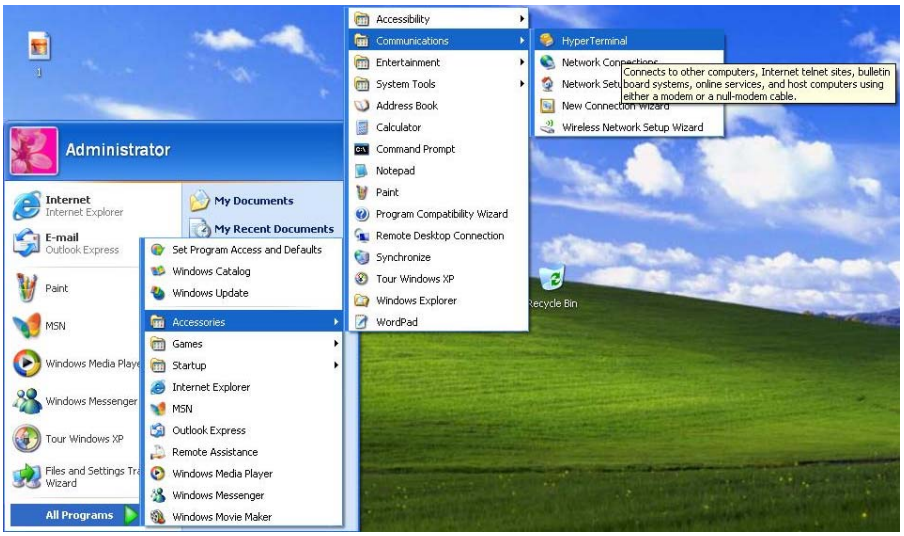
- Firmly connect the iCON-101CS's RS-232/422/485 connector to device's serial port.
- Firmly connect the iCON-101CS's CAN interface connector to CAN device.

Below we provide brief guide of how to configure hyperterminal and how to send commands via hyperterminal.

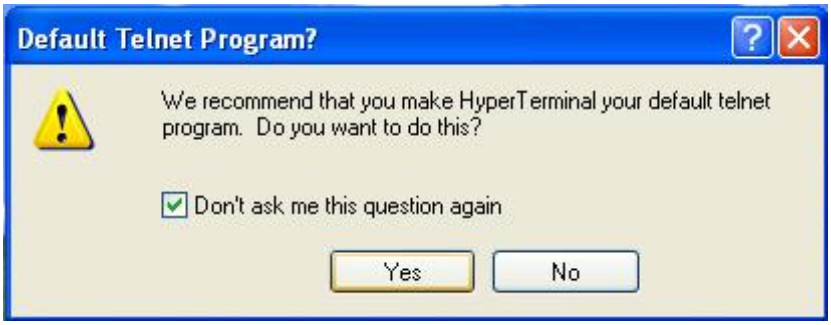
1. Go to Device Manager and check for serial port no. of your iCON-101CS. In this example, the port no. is COM4 (see below image).



2. Go to All Programs\Accessories\Communications, and click the Hyperterminal to open program.

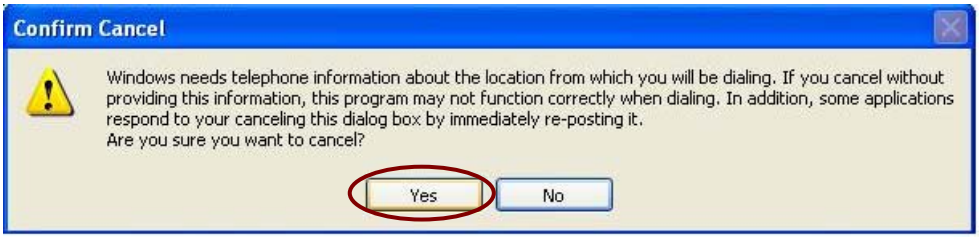


3. The next window appears, click Yes to go to next step.



4. When you see below window, just click Cancel to proceed.

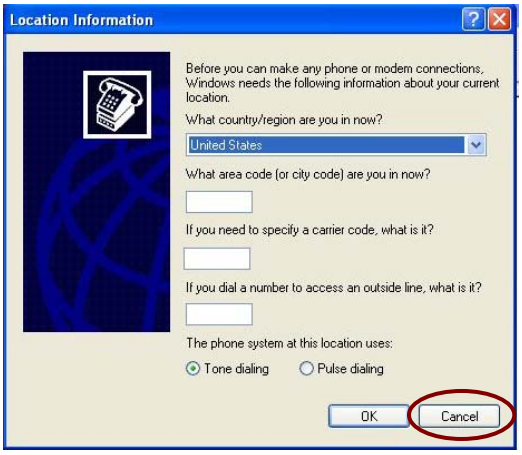
5. A window appears to confirm the cancellation. Click Yes to continue.



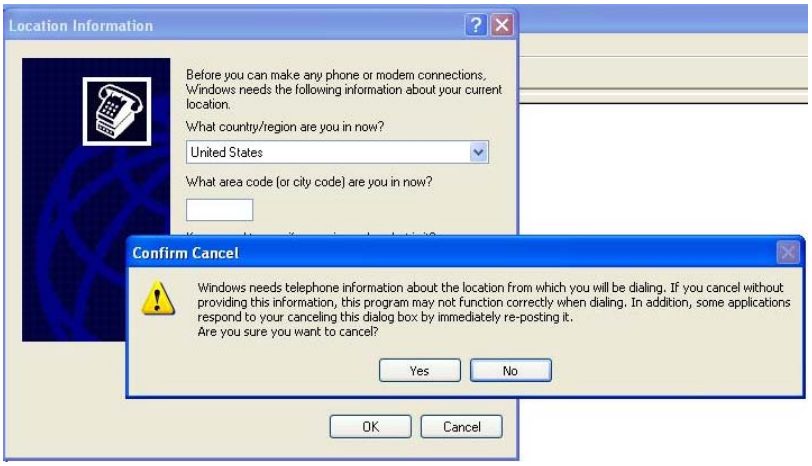
6. Below window appears to remind you to enter information about your location. Click OK.

7. Enter a name and choose an icon for the new connection. Then click OK.

8. The Location Information window appears. Click Cancel.



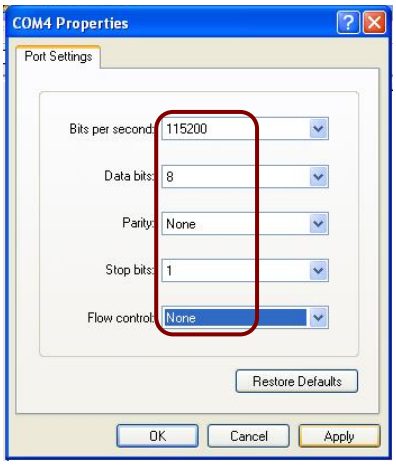
9. The next window appears. Click Yes.



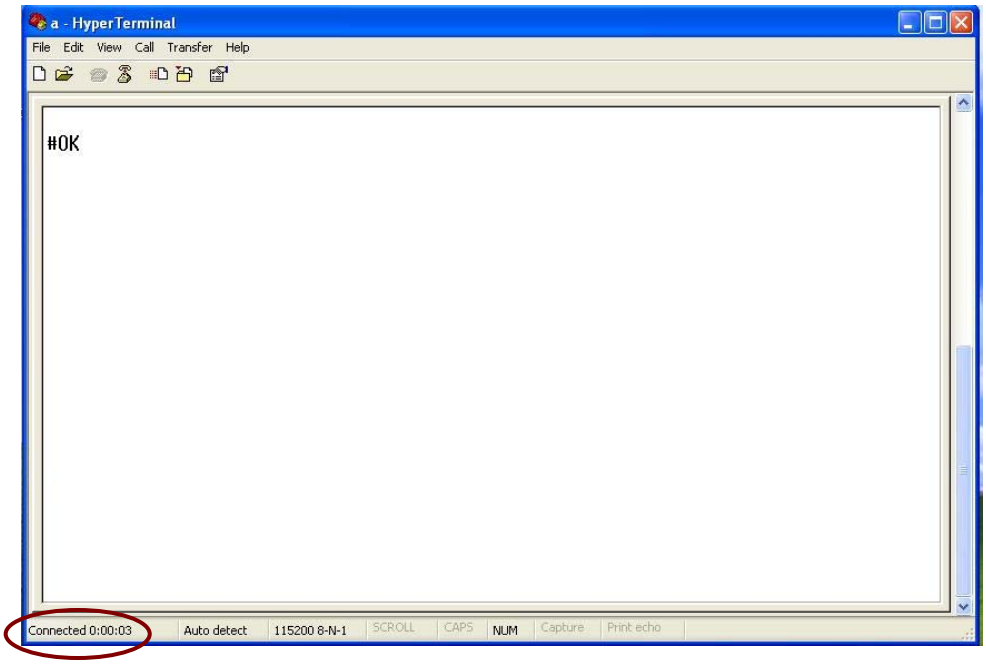
10. When you see below popup window, please click OK.

11. Select COM4 (refer to above step 1) for the serial port no. and click OK.

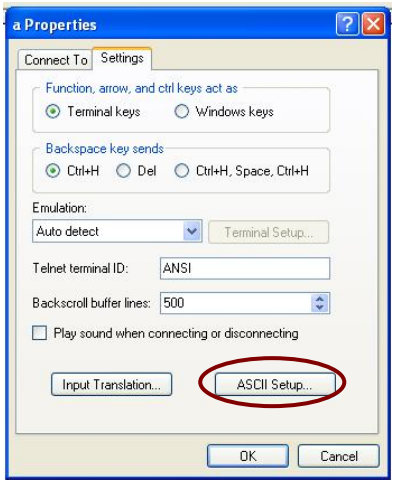
12. Enter COM4 properties according to below instructions. Then click Apply to connect.



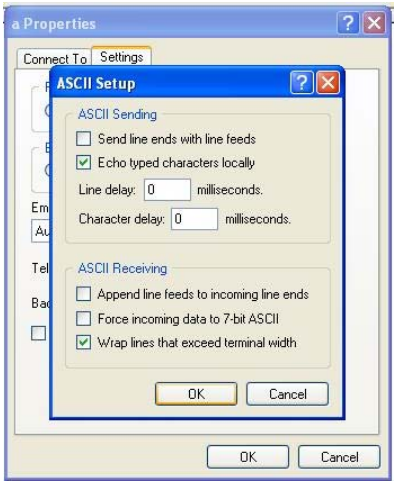
13. Verify the connection between your computer and iCON-101CS. Key in <Enter> and the iCON-101CS should return “#OK”.



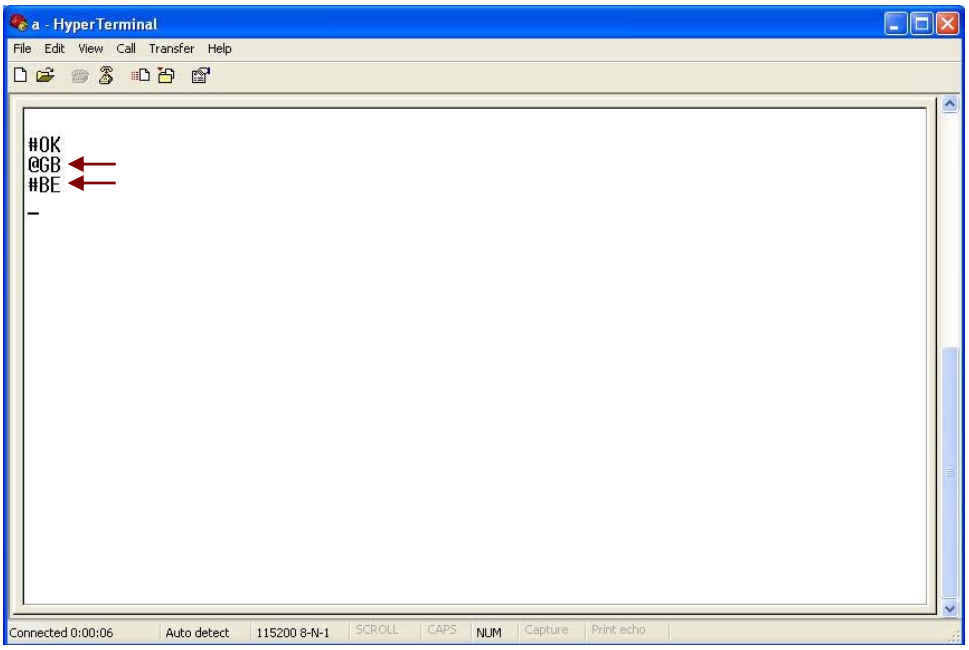
14. You should change some settings for sending AT commands. In the Properties page of hyperterminal, select Settings tab. Press the ASCII Setup button.



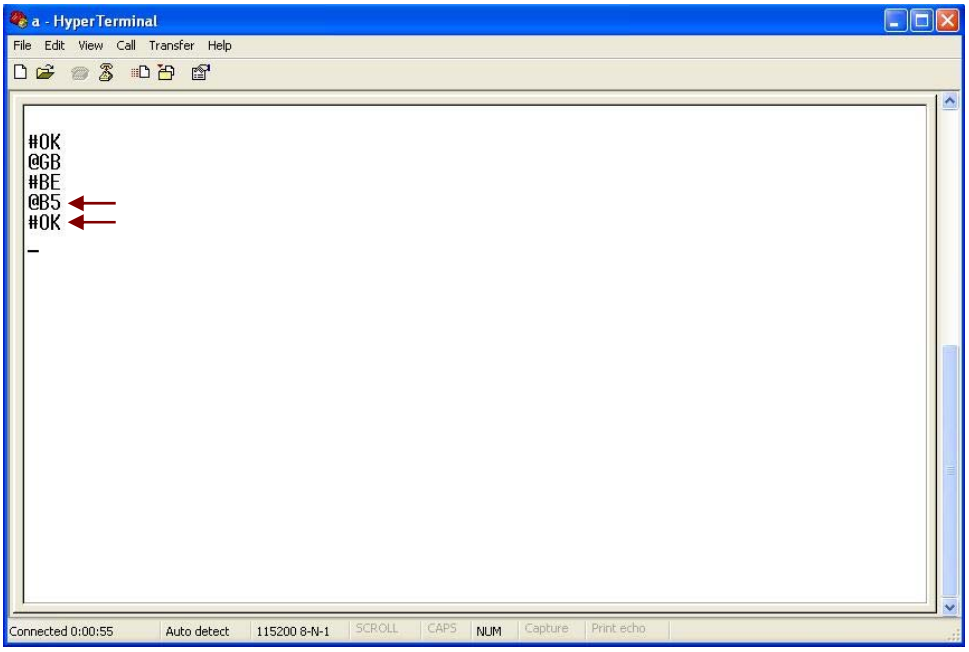
15. Follow the instructions in below image to configure ASCII settings and click OK.



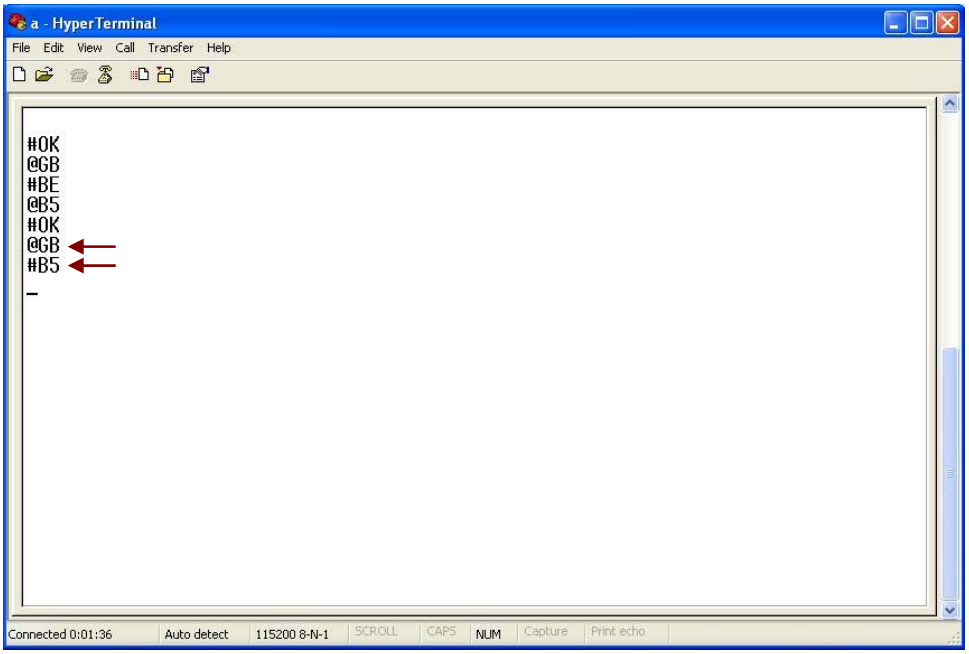
16. After completing previous step, you should be able to enter AT command. Key in "@GB" to retrieve bit rate of CAN port. In this example, "#BE" is returned from CAN port.



17. With the same method as in the previous step, you can change bit rate setting. Key in "@B5" to set CAN bit rate to 80KB. If no error occurred, you should see "#OK" on the next line.



18. To confirm your previous setting, key in "@GB" and you should see "#B5" on the next line. You can test the other commands in the same way.



5.7 Some Examples

In this section, we provides some examples of how to use command messages.

Environment Configuration:
Set up hyperterminal (see section 5.6 for detailed information):

- Baud-Rate: 115200 bps
- Data bits: 8
- Parity Check: None
- Stop Bits: 1
- Flow Control: None

Transmit Messages:

1. Command: @BE
   Do: Set CAN bit rate to 1Mbps.

2. Command: @S0
   Do: Configure receiving behaviors of CAN port; stop receiving when buffer is full, report in raw data and polling mode.

3. Command: @O100
   Do: Open CAN Port 1. Set it to normal mode and non-loopback.

4. Command: @t1000A00641238313233343536373 8
   Do: Transmit 100 messages every 1ms; ID=0x123, length=8 and data='12345678'.

Receive Messages: (Auto Report)

1. Command: @BE
   Do: Set CAN bit rate to 1Mbps.

2. Command: @S3
   Do: Configure receiving behaviors of CAN port; stop receiving if buffer is overflow, report data format and auto report mode.

3. Command: @O100
   Do: Open CAN port 1. Set it to normal mode and non-loopback.

4. Command: @S3
   Do: Set to data mode and report data automatically if CAN port is open.

Receive Messages: (Polling)

1. Command: @BE
   Do: Set CAN bit rate to 1Mbps.

2. Commands: @S2
   Do: Configure receiving behaviors of CAN port to stop receiving if buffer is overflow, report data format and polling mode.

3. Command: @O100
   Do: Open CAN port 1. Set it to normal mode and non-loopback.

4. Command: @Z1
   Do: Enable timestamp.

5. Command: @GR
   Do: Retrieve message out of receive buffer.